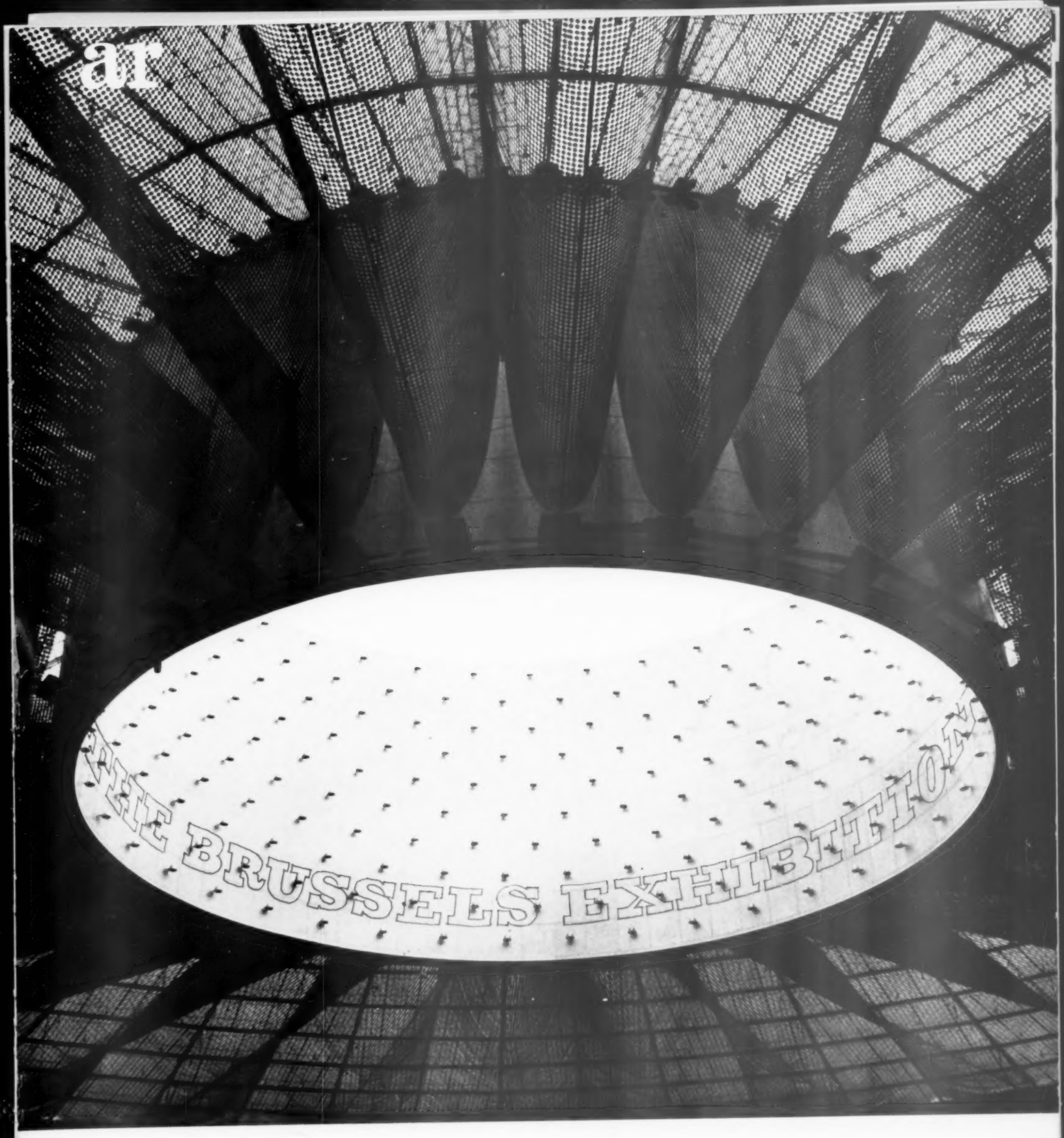
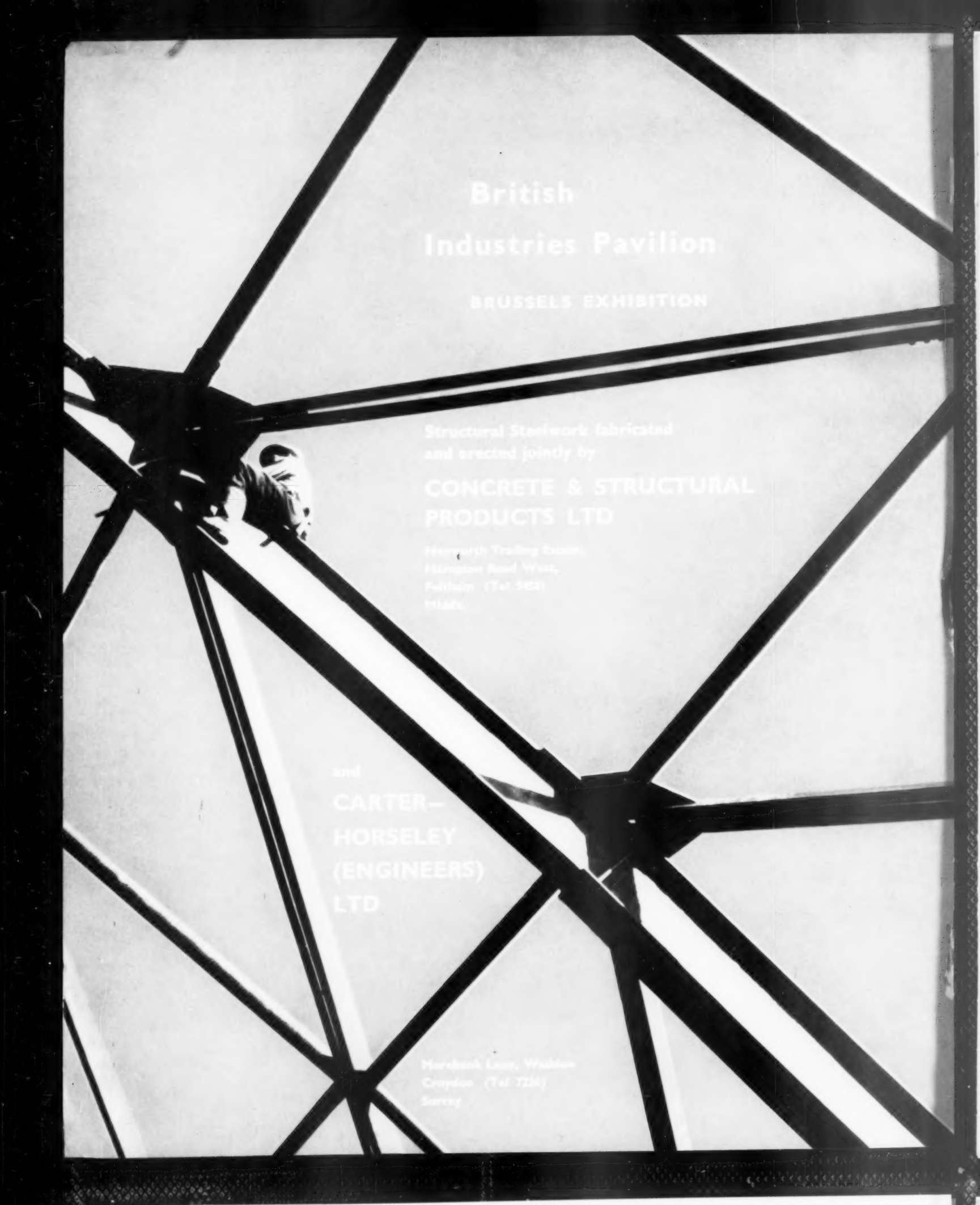


THE ARCHITECTURAL REVIEW VOLUME CXXIV NUMBER 739 AUGUST 1958 FIVE SHILLINGS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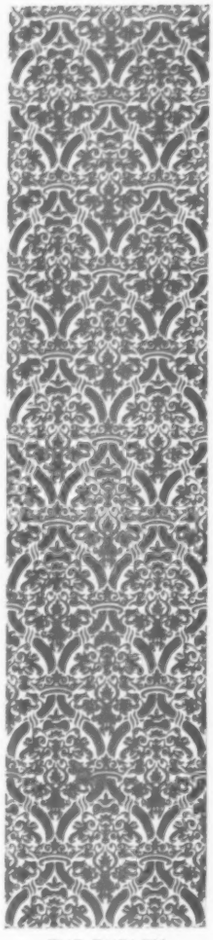
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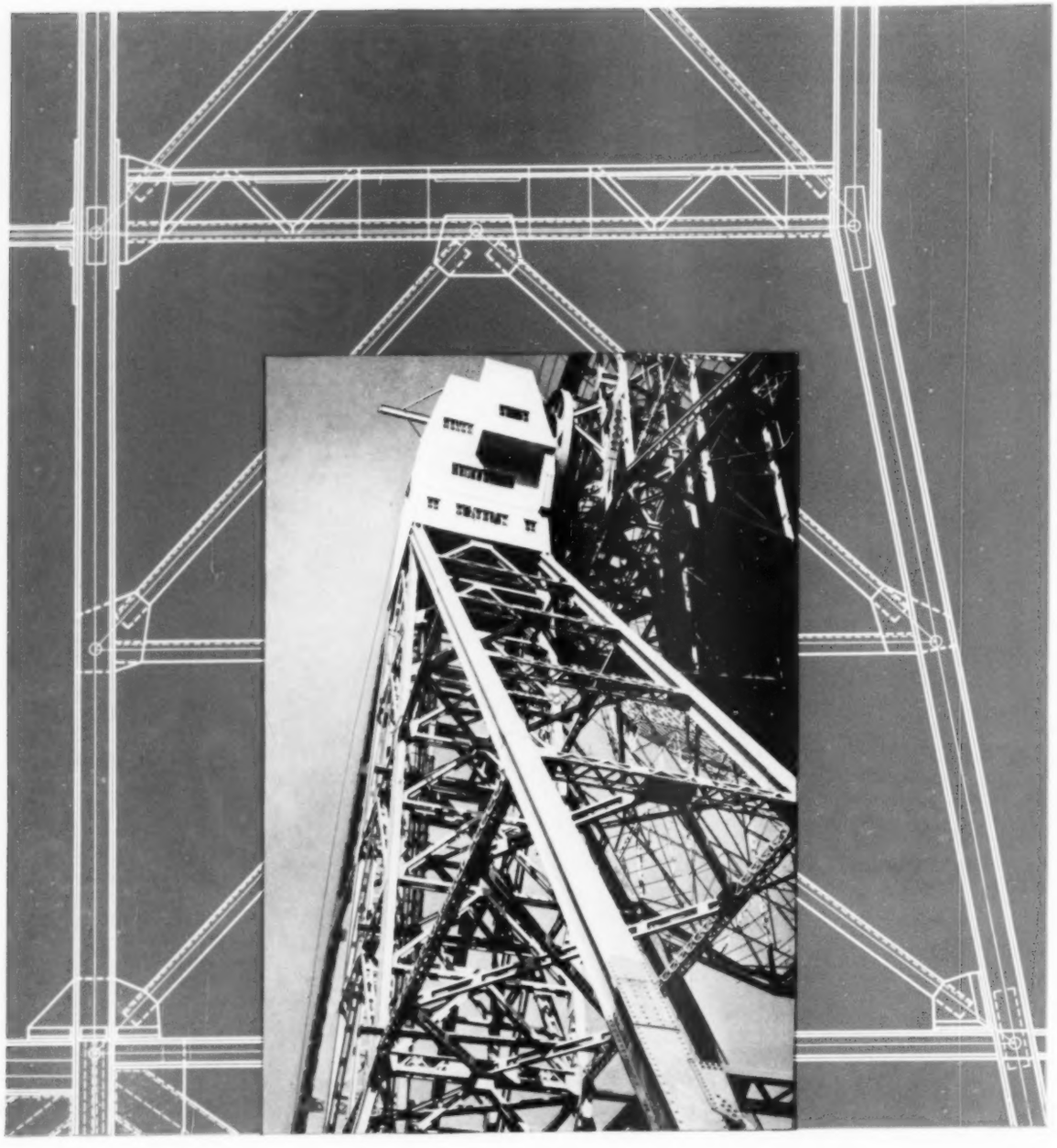

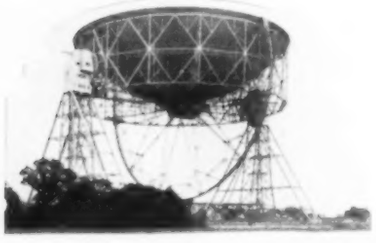

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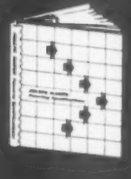

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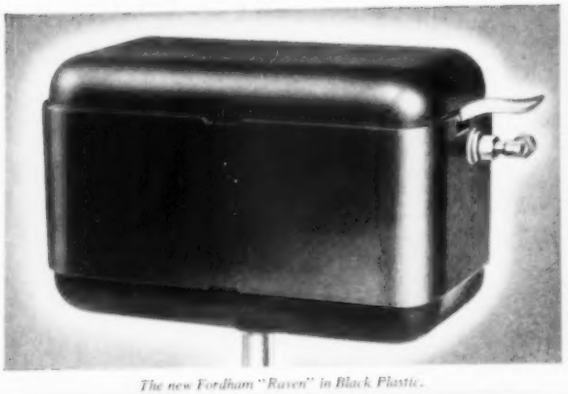
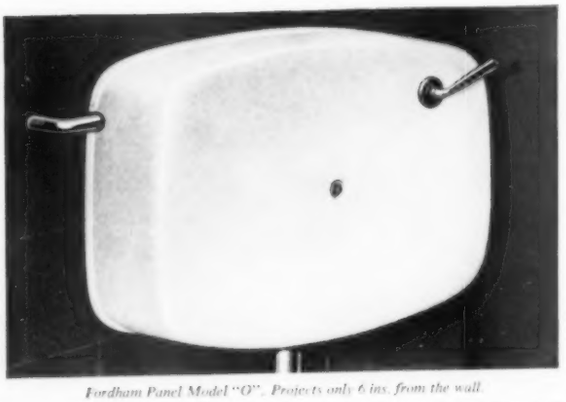


The new Fordham "Raven" in Black Plastic.



Fordham Panel Model "O". Projects only 6 ins. from the wall.

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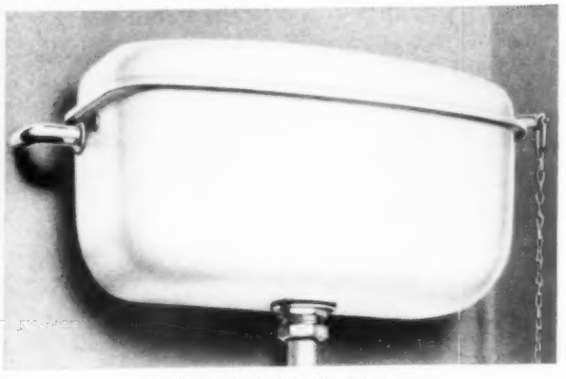
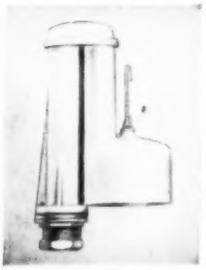


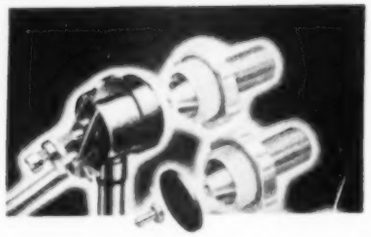
Fordham "Cleanline" high level cistern.

Look to Fordham for leadership in the design and development of Sanitary Equipment. The new range of Fordham "Cleanline" Cisterns—accepted by the Council of Industrial Design for "Design Review"—are the most handsome and least expensive cisterns obtainable today. In White or coloured vitreous finishes to match any scheme of decoration, they are available in Ivory, Primrose or Green at the cost of White. The recent addition to the Fordham range is the "Raven" in Black Plastic—superbly efficient, beautifully finished, and at an unrivalled low price. All models are fitted as standard with the incorrodible Fordham All Polythene Syphon and Ball Float and are available with the revolutionary new "Acquasave" non-stick toughened plastic ball valve. Illustrated literature will be sent on request.

Fordham Polythene Ball Float.



The Fordham All-Polythene Syphon.



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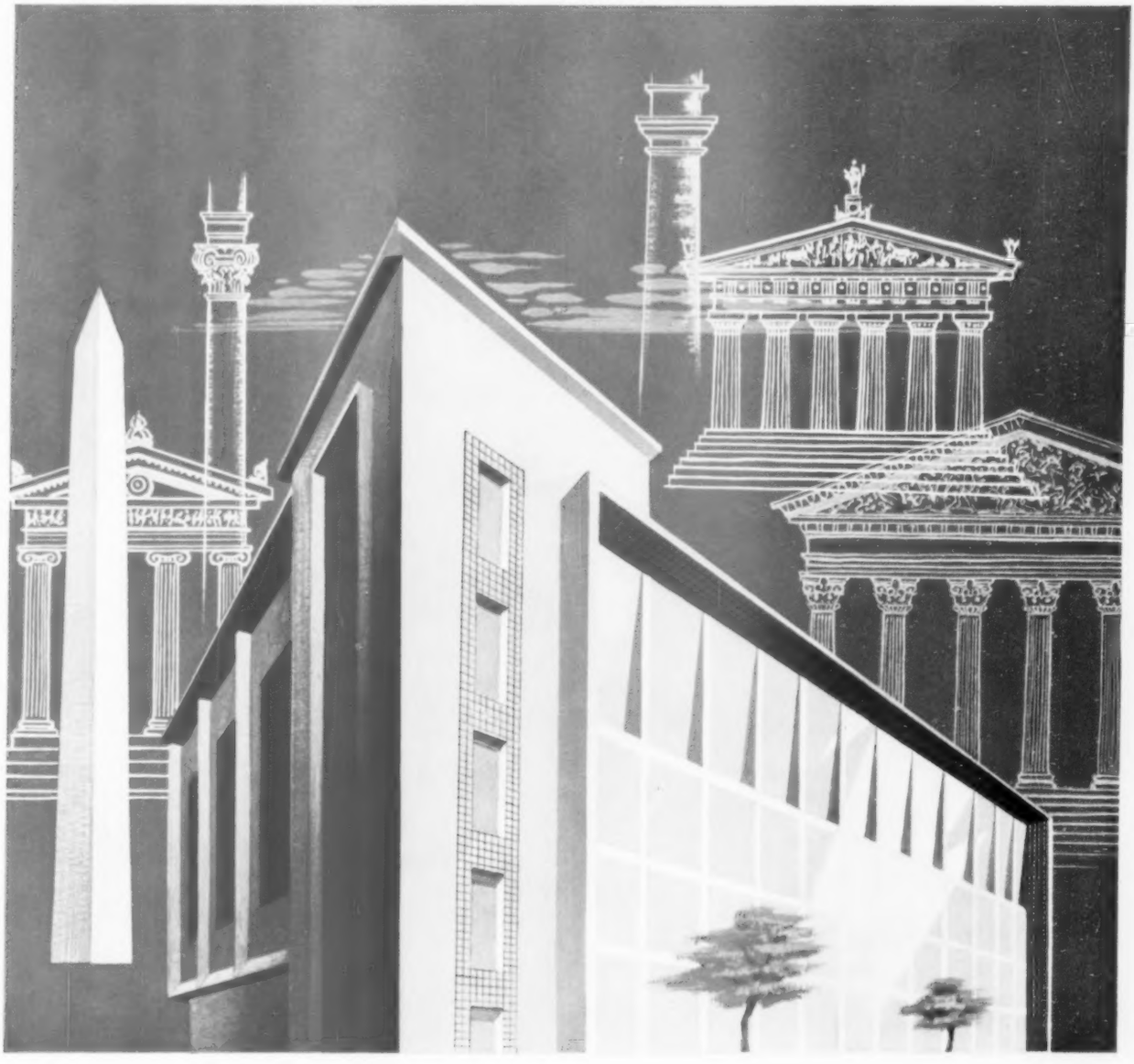
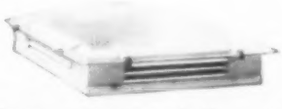
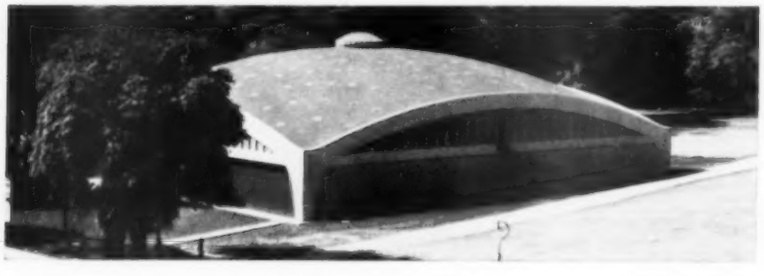


At the new Wimbledon covered courts a central ventilator was needed 14 ft. in diameter. Greenwood-Airvac engineers designed and built a special fitting, shown above, photographed from inside, and, below, from the outside.

Spectacular tasks of this kind broaden the experience which helps Greenwood-Airvac build a *Standard Range* of roof ventilators to meet, efficiently and economically, the vast majority of demands for ventilation and daylight. The cut-out illustrations below are two examples, both of which carry standard glass or 'Perspex' domes. Circular ventilators from 18 in. to 6 ft. diameter, rectangular from 2½ ft. square to 4 ft. x 6 ft.



Please write for the new illustrated data sheets on Greenwood-Airvac ventilators



Greenwood-Airvac *ventilation*

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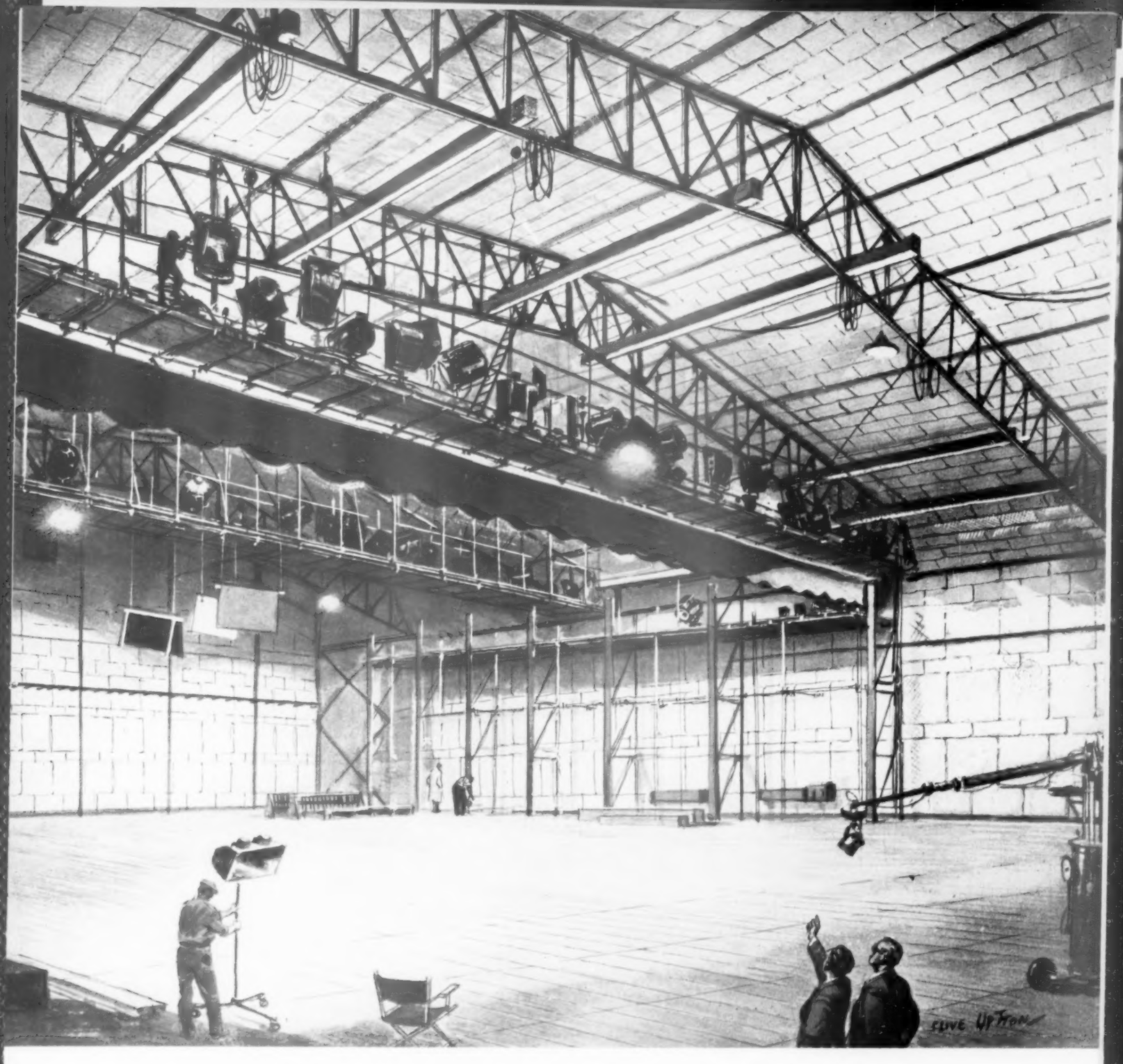

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Inside the British Industry Pavilion, a rectilinear structure of steel and glass curtain walling, the general lighting is wholly indirect. Mazda fluorescent lamps in suspended troughing light up the white painted underside of the aluminium roof, picking out the pattern of the blue-grey structural supports.

Under the canopy before the entrance are clusters of 'Satina' fittings. A group of these fittings, designed by A.E.I., have recently been chosen as one of the Designs of the Year (1958) by the Council of Industrial Design.

The A.E.I. main interior lighting system was chosen from schemes put forward by a number of lighting manufacturers working within a budget limit of £5,000.

Architects: Edward D. Mills & Partners.
Electrical Contractors: James Kilpatrick & Son Ltd.

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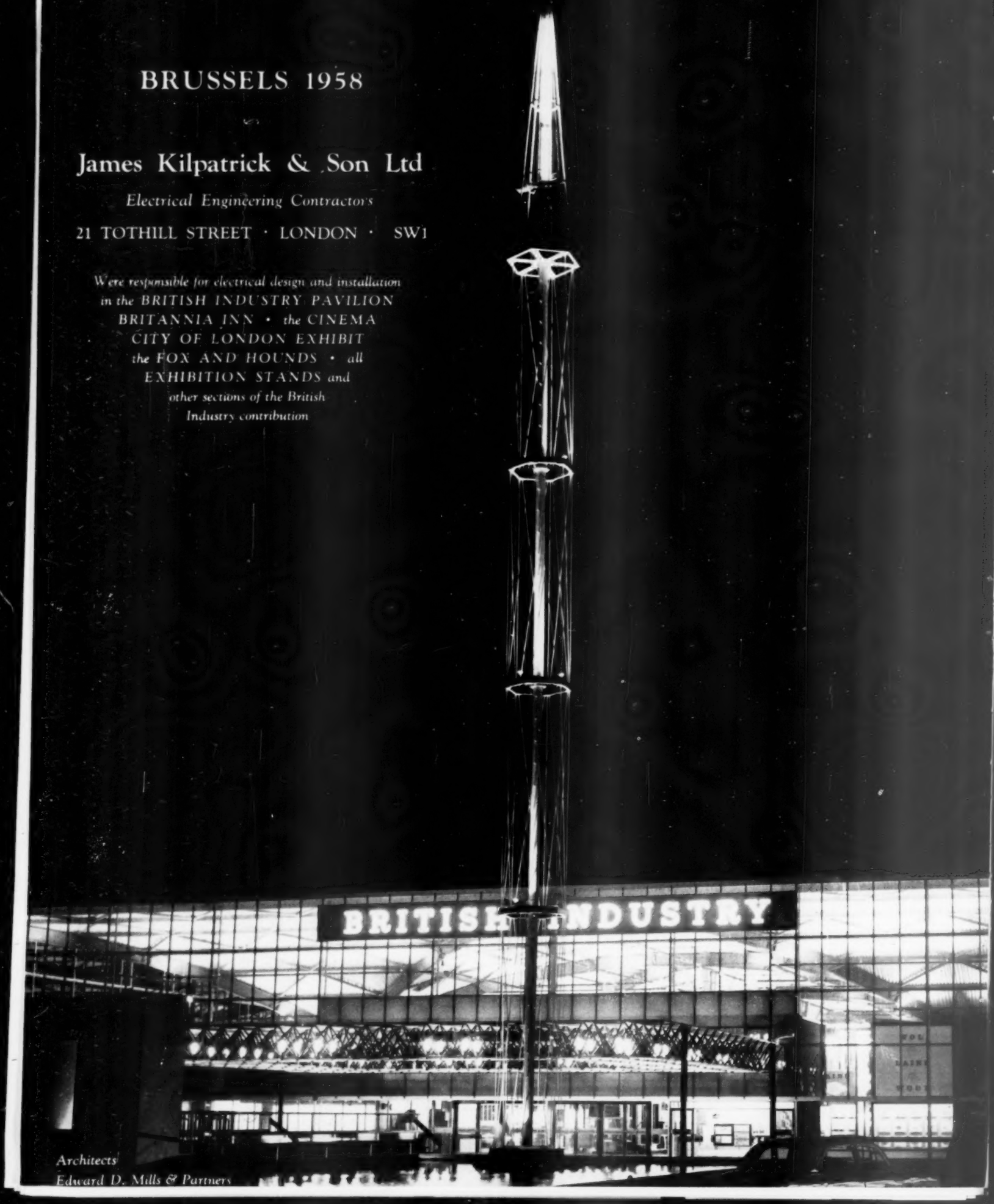

Architects
Edward D. Mills & Partners

MK152
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ARCHITECTS:
Edward D. Mills & Partners

Gridswitches at Brussels

MK Gridswitches and 13 ampere switchsocket-outlets and socket-outlets were selected by the Electrical Engineering Contractors, Messrs James Kilpatrick & Son Limited, for exclusive use within the various buildings in the British Industry section at the Brussels Exhibition. MK accessories are also installed in the Offices, Sub-stations Nos. 1 and 2, the Britannia Inn, the Fox and Hounds, the Cinema, the Self-Service Shop, and on Exhibition Stands.

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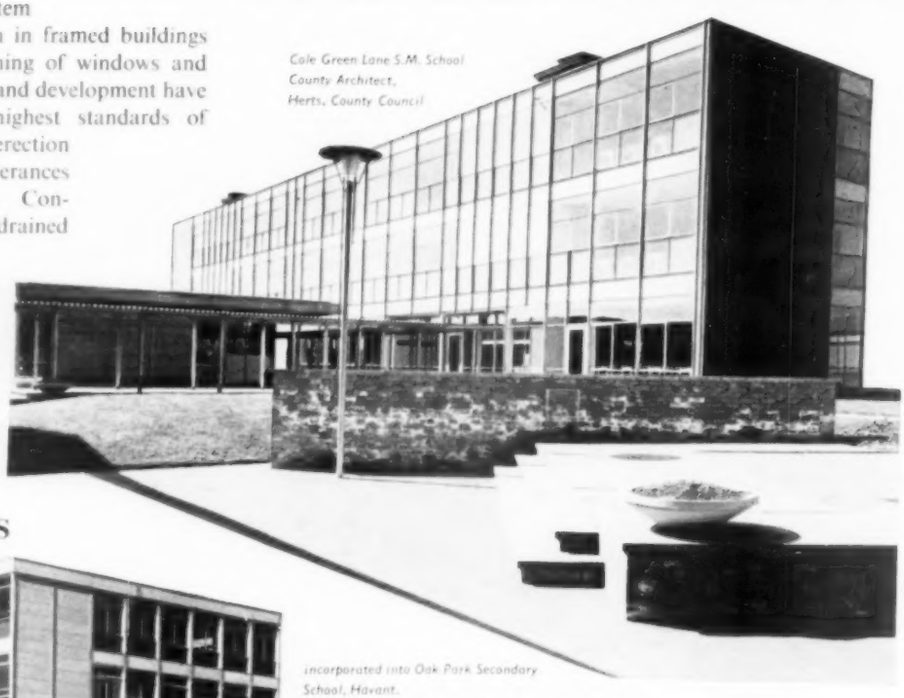

Cole Green Lane S.M. School
County Architect,
Herts. County Council

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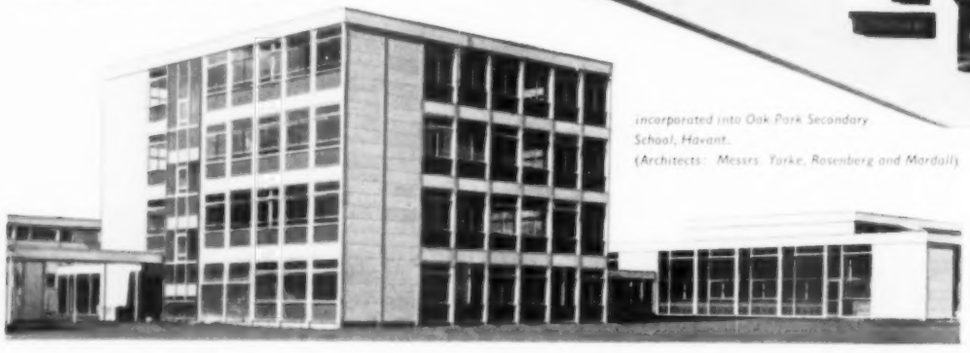

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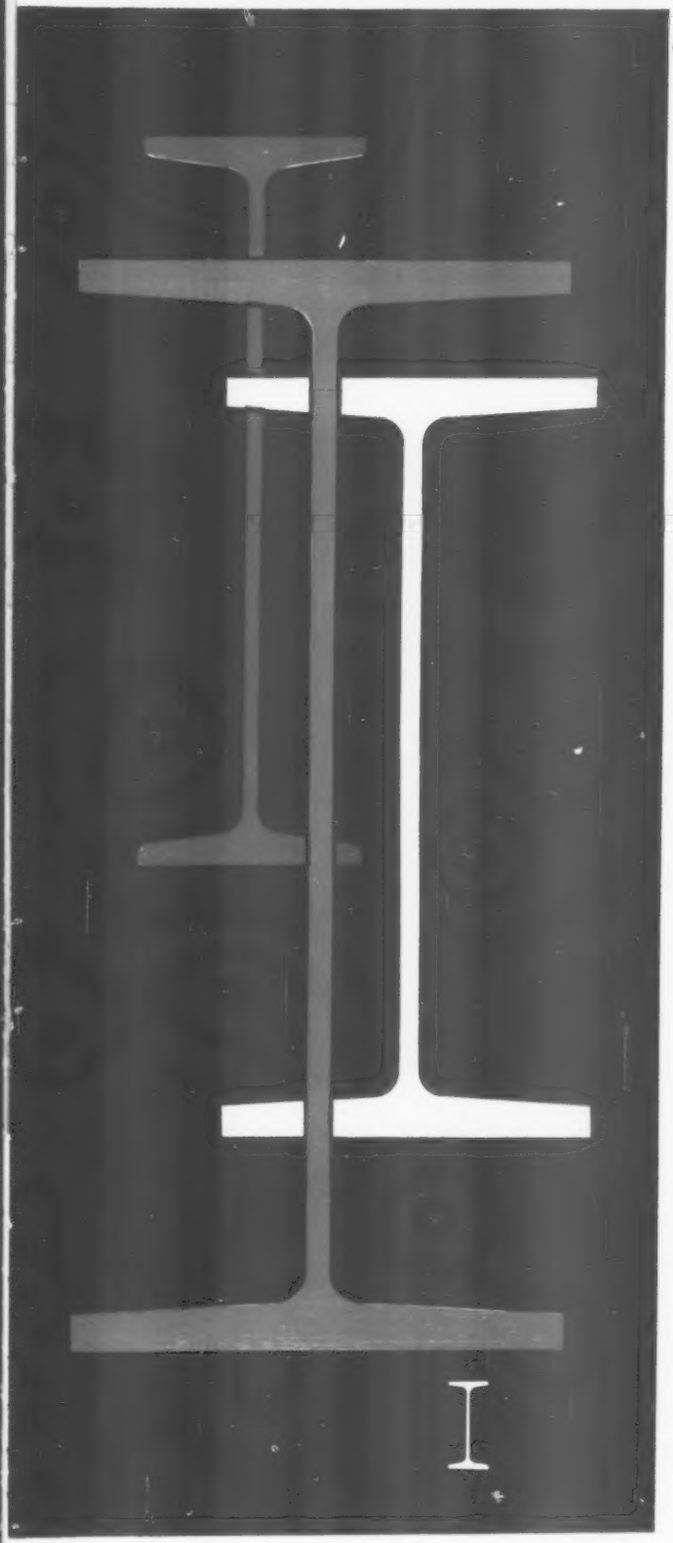

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Other examples of Decorated Plyglass at Brussels are the glass screen designed by James Gardner in the Hall of Science and Technology of the British Government Pavilion and the route maps of B.O.A.C. and B.E.A. at the joint stand of the air corporations.

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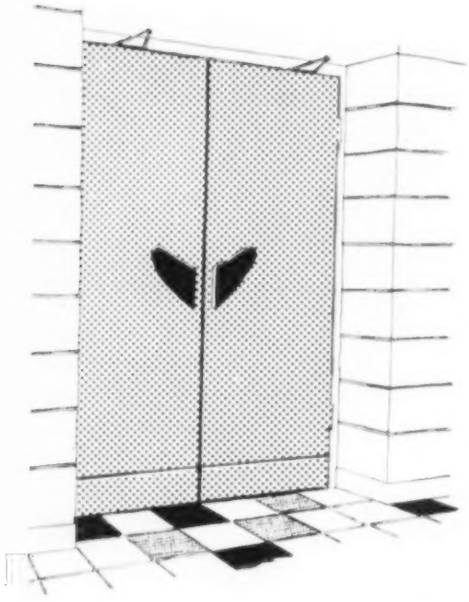

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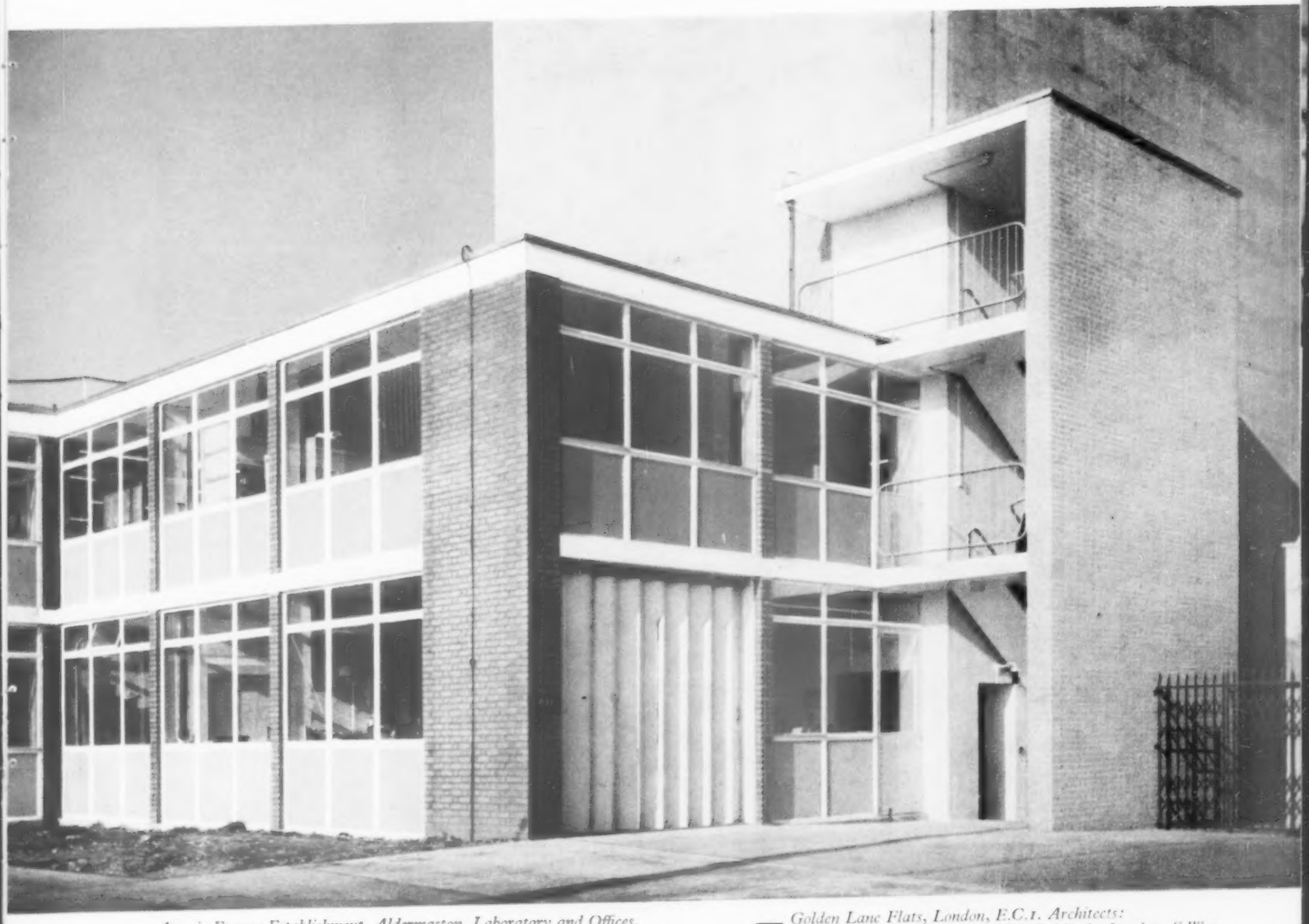

Atomic Energy Establishment, Aldermaston. Laboratory and Offices. Designed by the Chief Architect's Division, Ministry of Works, London; Senior Architect: K. H. Choate, A.R.I.B.A. 'MUROGLASS'.

Golden Lane Flats, London, E.C.1. Architects: Chamberlin, Powell & Bon, A/A.R.I.B.A., London, S.W.3. 'MUROGLASS'.

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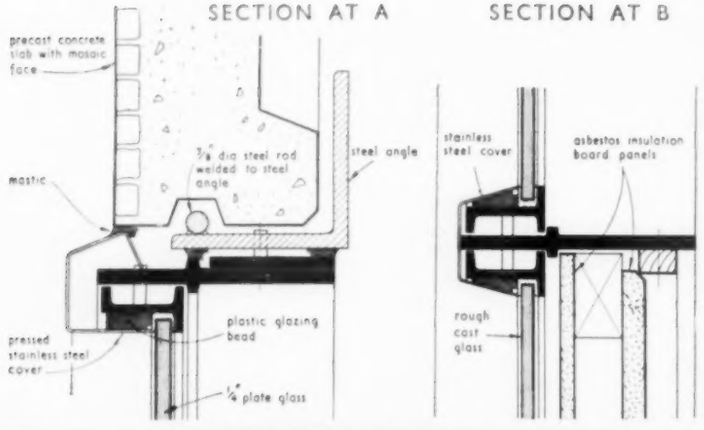

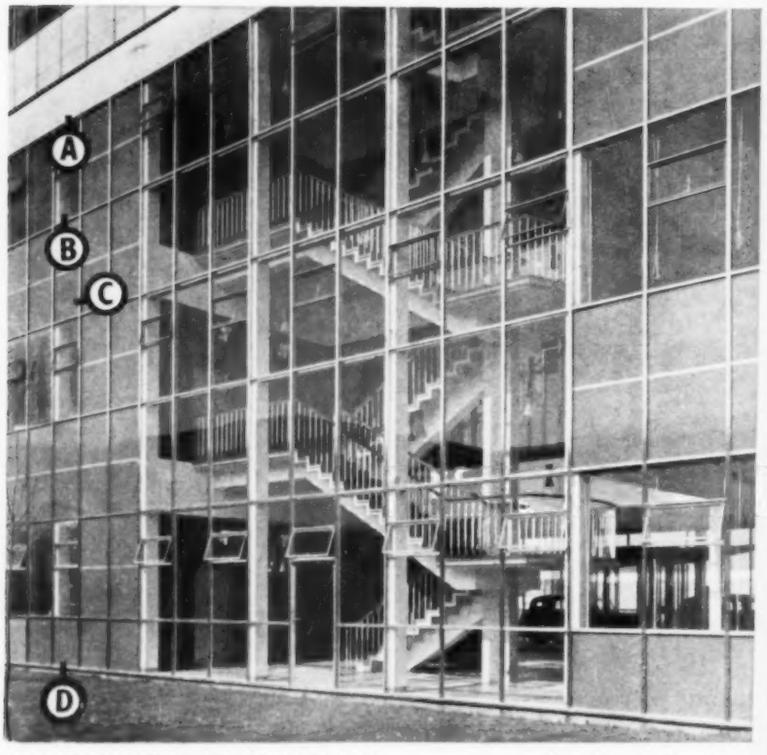

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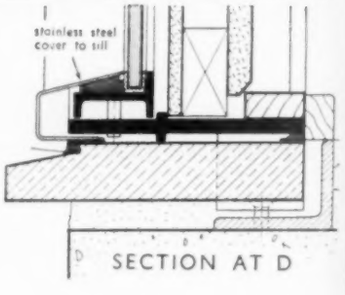

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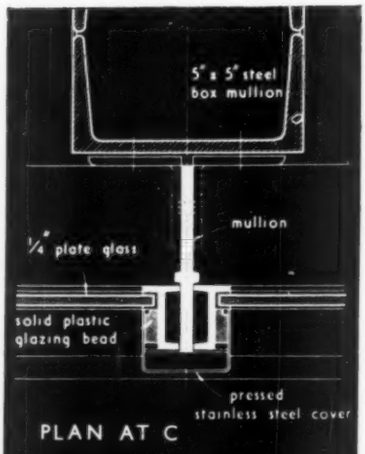

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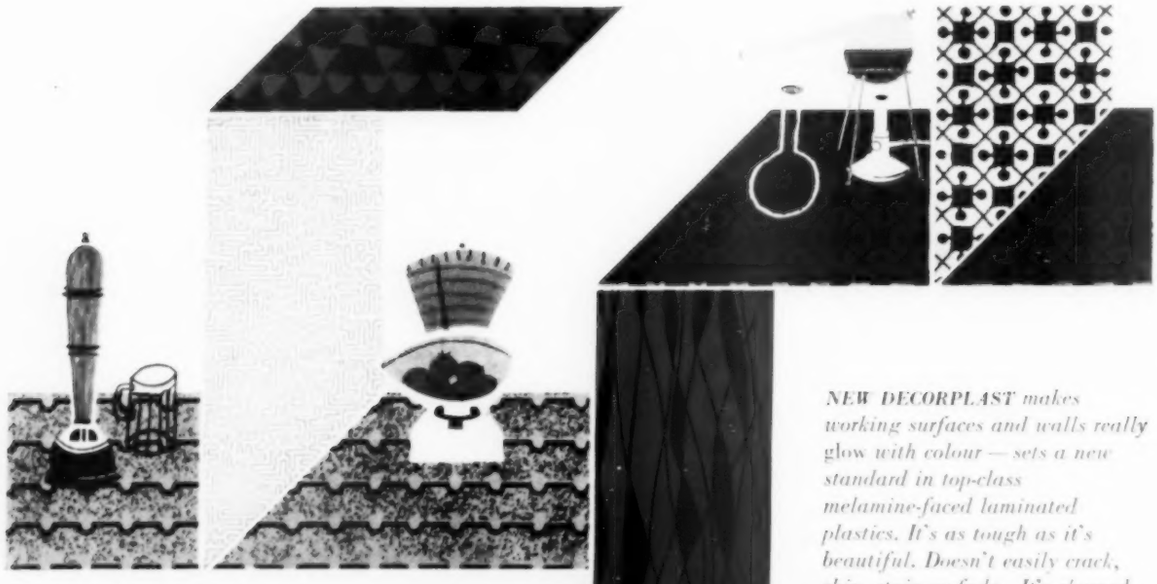

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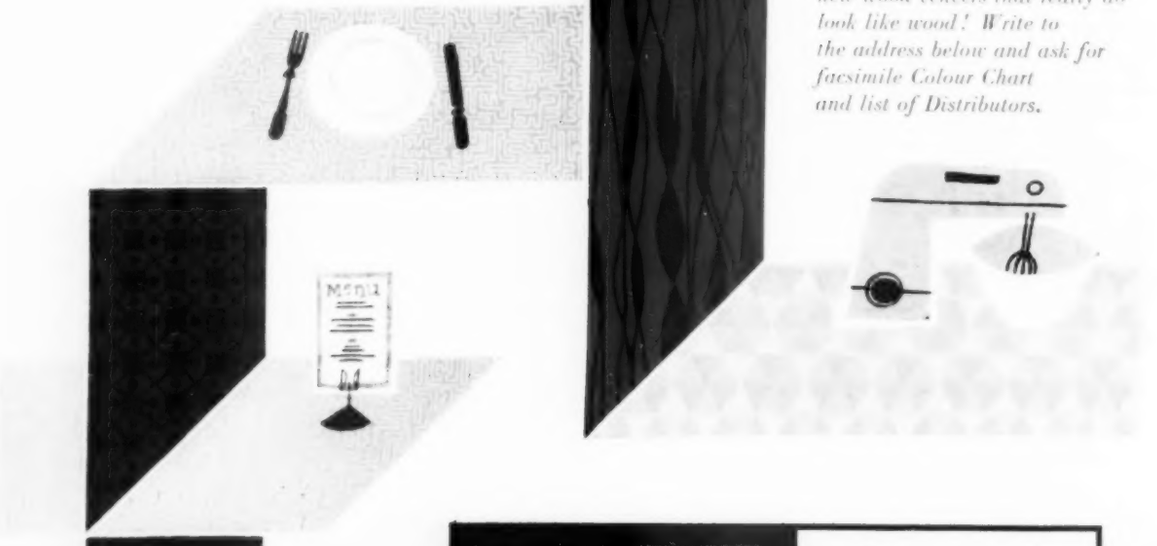

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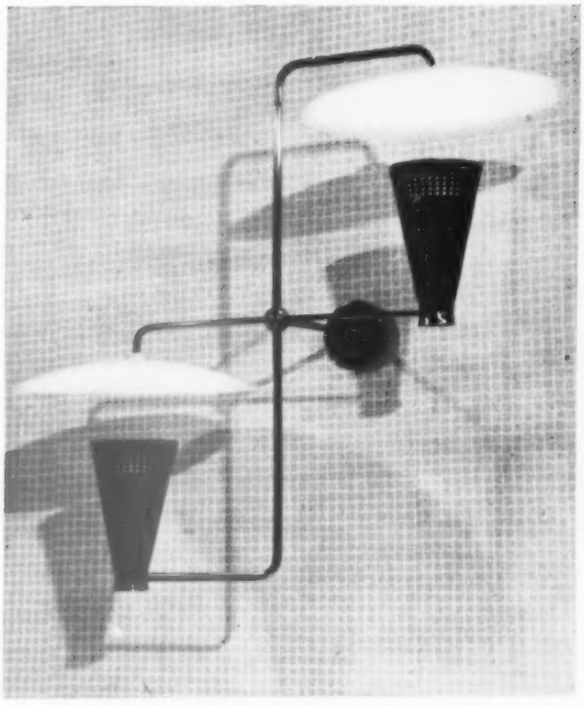

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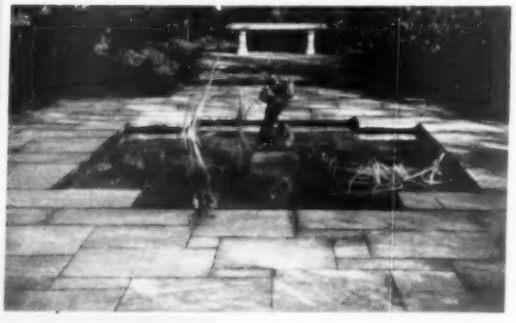

Above, Left: Riven Stone at Southlands College, Wimbledon. Architects: F. R. S. Yorke, E. Rosenberg, C. S. Mardall, FF.R.I.B.A. Assistant in charge, Lloyd A. Smith.

Above, Right: Rectangular Garden Paving. Garden Architect: Percy S. Cane, Esq., S.W.1.

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Left: Stone Walling, Ling Bob Primary School, Halifax. Architect: K. W. Craven, A.R.I.B.A., Dip.T.P., A.M.T.P.I.

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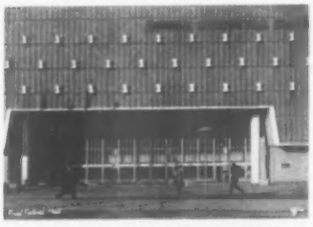
MARGINALIA

Postable Views

Unlike the best of those available on the Continent and in the USA, most British picture post-cards are neither stimulating nor glamorous—outside the National Gallery and the Tate it is difficult to acquire anything of the quality that can be bought in, say, Florence, and our attempts at king-size views in astounding technicolour have so far been pathetic. In particular, our so-called 'architectural cards' have tended to be dim, uninformative, or both.



1, 2, two of the Gordon Fraser series of postcards.

Now, however, the Gordon Fraser Gallery of Bedford, who wrought a minor revolution in the Christmas card business a few years back, have moved into architectural view cards in a highly promising way, with the beginnings of a series of monochrome photographic views whose visual quality is comparable with that of the highest levels of architectural publishing—and is, indeed, the work of photographers employed in that field. Some of the pictures are already established classics, such as the Gernsheim views of St. Paul's and of effigies in Westminster Abbey, originally made for the Warburg Institute. Others are the work of established leaders in the field, like Eric de Maré, Reece Winstone, and H. F. Kersting.

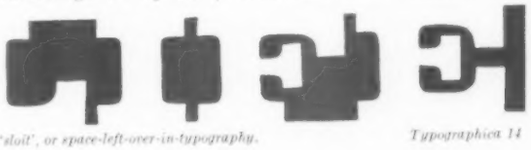
Not the least remarkable aspect of this new venture is its widening of the established range of subjects, and a serious attempt has been made to cover modern buildings like the Festival Hall—as a building, 1, and not merely as a piece of riverside scenery—while the even more tricky business of photographing for vernacular or townscape character has also been undertaken. Colin Penn has begun here with views of Hampstead Village, 2, and the terraces of Bath are shortly to be taken in hand. The information given on the backs of these cards, which will sell at the sensible price of sixpence, is genuinely informative but not always as plentiful as it might be—not every card of the Festival Hall, for instance, gives the architects' names. On the other hand, the fact that *any* of the cards should give their names is a measure of what has been attempted, although the actual quality of reproduction still falls (for financial reasons as yet insuperable) below the level of the finest continental cards produced by direct photographic methods.

Critical Vehicle

At a time when there are probably more working, professional or semi-pro. art critics in England than ever before, much of their output continues to be, of necessity, hit-and-run journalism for the weekly press, or the grand old fortnightly, *Art News and Review*, that bred so many of them. The need for a more slow-moving vehicle, that might encourage the contemplative rather than the descriptive virtues, has been discussed for some time, and seems now to have been answered by the foundation of *The Painter and Sculptor*, a half-crown quarterly whose first issue has recently appeared. Although this first number falls below the visual quality one might have hoped for in a periodical of this kind, and some of the authors have not yet changed down out of overdrive, the two middle essays—one by David Thomas on Ruskin's late preoccupations with industrial smog, and the other by Roger Coleman on Peter Blake, 'a Charing-Cross-Road Pre-Raphaelite'—both show that there are men who can ride this unduly rare kind of critical vehicle as if they had done so all their lives.

Sloit

Much has been heard recently about 'Sloip' or space-left-over-in-planning, and most of what has been heard has been justifiably hostile. But the unconsidered left-overs of most of the arts require more treatment than they get. In typography, because of their influence on readability, these left spaces have been studied scientifically for some time, but more recently, W. J. Sandberg, director of the Stedelijk Museum in Amsterdam, and creator of the distinctive Stedelijk-style of catalogue design, has published his *Experimenta Typografica*, which make full use of the visual qualities of all aspects of lettering, negative and positive. Thus, the row of abstract shapes resembling an Olivetti poster, 3, reveals itself on a second examination, as the Sloit of a common, and readable English word, set in a species of type-face that the REVIEW has long supported.



3, an example of 'sloit', or space-left-over-in-typography.

Typographica 14

5, the fireplace in the Conversation Room, Keio University.

Casa Valsugana ali Aslant

It has been observed before now that when architecture looks most irrationally formalist, the most convincing-sounding logical-functional arguments are available for its defence. Nevertheless, the Casa Valsugana, 4, designed by Mario Galvagni, would strain even the most plausible double-talker, and most of the arguments offered on its behalf have stressed its suitability to its site in mountainous country and its use of local materials. In fact, its sections are less illogical than might be supposed, its planning is straightforward, and the biggest adverse criticisms that can be levelled at it are concerned with what seems to be an unduly massive reinforced concrete frame, and the large earth ramp and retaining walls that appear to be necessary to hold it up.

4, Casa Valsugana.

Best of Both Worlds

In spite of Modern Architecture's heavy debt to the art of Japan, the reintegration of Japanese architecture into the International Style has, with a few exceptions, been clumsy and brutal. One of the most notable exceptions is the Conversation Room, 5, of the faculty retreat of Keio University, near Tokio, where the architect Yoshiro Taniguchi and the Japanese-American sculptor Isamu Noguchi have collaborated to produce an interior of striking grace and spartan ease. Its furnishings are disposed partly in a general scheme

6, 7, two more views of the Conversation Room.

focussed concentrically on the fireplace, 6, and partly in two privately-focussed corners, of which one is seen in 7, apart from the main area. The design idiom in which the whole is couched is so sensitively adjusted that one is not immediately aware of the extent to which the native manner has been adapted to Western conceptions—yet the whole plan, and each individual piece of furniture, are quite anti-traditional in intention. This sensitive balance between two cultures is undoubtedly due to Noguchi, a man firmly grounded in both.

High Rise in Harvard

Details have recently been released of Harvard University's scheme for the reconstruction of a whole block lying between The Yard and the Harvard Houses on Massachusetts

8, model for a new block at Harvard.

Avenue. Designed by Harvard's Dean of the School of Design, José Luis Sert, the main H-plan block, 1, rises ten storeys in an area previously of only five floors average height. Overcongestion of the urban scene is avoided by the plan-form which brings only one or two-storey subsidiary buildings, such as shops, up to the old building line, and in other places leaves clear plazas for pedestrians. The scheme also provides for covered pedestrian passages to pass under the blocks, two from side to side, and one lengthwise, providing, in effect, a covered passage from the Yard to the Houses. Inception of the scheme waits on the availability of funds, and it may be carried out in two phases.

CORRESPONDENCE

Count Rumford

To the Editors,

SIRS,—Mr. Sparrow's recent article on Count Rumford implies that Rumford was responsible for the circular Ionic temple in the Englischer Garten in Munich. It was in fact built nineteen years after Rumford's death by Leo von Klenze, in honour of the Elector Charles Theodore.

This temple is of some importance in the history of architecture, since it may well have been the first Greek Revival building to be coloured in accordance with the principles discovered by Hittorff in 1823, published by him in 1830, and publicized by Kugler in his *Uber die Polychromie der Griechischen Architektur* in 1835. In a letter addressed to the RIBA on 2 June, 1837, von Klenze claimed that 'to the best of my knowledge, it constitutes the first example of lithochromy in the present day.'

Yours, etc.,
PETER COLLINS.

Montreal.

Liturgical Brief

To the Editors,

SIRS,—In his article 'A liturgical brief' in your April issue the Rev. Peter Hammond selects a casual sentence of Professor Basil Spence, treats it as an expression of the chief function of the new Coventry Cathedral and condemns it as inadequate. In answer to this two things must be said.

(1) The basic expression of the function of the new Coventry Cathedral is to be found in the book of conditions given to the competing architects. 'The doctrine and the worship of the Church of England is liturgically centred in the Eucharist. The cathedral should be built to enshrine the altar. . . . In the Anglican liturgy it is the people's altar: the altar should gather the people, it should offer access for worship and invitation to Communion.' And: 'The altar should be placed towards the "East" in such a position that as many as possible of the congregation may have a clear and uninterrupted view.' This is precisely in other words what the Rev. Peter Hammond says: 'The church is seen first and foremost as the place where the local Christian community gathers for the eucharist.'

The reason why the assessors gave the award to Professor Basil Spence out of two hundred competitors was that they considered that his design most adequately fulfilled the stated liturgical functions of a cathedral. Anyone studying his ground plan side by side with those given by the Rev. Peter Hammond will see that it compares favourably with them. If it does not break violently away from the traditional rectangular shape of the past, if the altar sparkles with beauty, and if there is a sense of vista, these features do not in the least detract from the main function of the cathedral as stated in the conditions.

(2) When Professor Spence says that 'a cathedral in England has a greater purpose than a church in which *only* to hold services . . . the object of this cathedral is to turn the visitor . . . into a worshipper,' what he has in the forefront of his mind is the sheer fact that for every one person who has the opportunity of joining in liturgical eucharistic worship (admittedly the chief function) there are a hundred persons who hourly throughout every day enter the cathedral as visitors. To ignore these would be a contradiction of the purpose of the Christian church—community or building. The cathedral must adopt a second primary purpose, namely to turn the casual visitor into a worshipper. Hence Professor Basil Spence, in co-operation with the Coventry Cathedral authorities, is planning to make the interior of the cathedral an instrument of teaching and inspiration, bringing various forms of the arts into the service of the people to the glory of God. The great tapestry and the eight mural panels are among the chief of these. It is intended and believed that, moved by these works of art, many who come merely to see will stay to worship. We have no hesitation in placing this as a fundamental function of a cathedral side by side with that of liturgical worship.

R. T. HOWARD,
Provost of Coventry.

To the Editors,

SIRS,—I feel that it is too much of a generalisation to say that, 'the most successful churches of recent years have been inspired by . . . the Liturgical Movement.' If this is true, the churches the Reverend Peter Hammond selects to illustrate his article fail to support his argument.

If we take as orthodox, or non-Liturgical, churches where the congregation sit more or less facing the front of the Altar, or Altar Table, which is placed near to, or against a wall, 17 out of the 25 churches shown (where an Altar can be identified) are of this type. Of the 8 which are Liturgical (congregation on three sides of Altar, or Altar in centre) 2 appear to be projects and in 7 of the 8 examples only plans are shown.

I have seen about half of all the churches illustrated, including SS Felix and Regula at Zurich and find it difficult to see just how this differs from the orthodox church plan except that it is wider and shorter.

The point of all this is that it is inaccurate, and in my view, unfortunate, to try and equate good church design with a particular theological movement. I entirely agree with Mr. Hammond that there are very few successful modern churches in this country and several good ones on the Continent but I think this can be blamed quite simply on the traditional machinery of the English churches for selecting and briefing architects, and the shortage of able, sensitive and established designers.

Yours, etc.,
TOM MELLOR.

Lytham St. Annes.

Peter Hammond replies,

I entirely agree with Mr. Mellor that the rarity of successful modern churches in this country is due largely to the Church's failure to provide the architect with an adequate brief; the Coventry 'conditions' are a case in point. What he fails to recognize, however, is that it is precisely here that the crucial problems arise. It is not a matter of machinery. The depressing irrelevance of most of our post-war churches reflects our failure to come to grips with certain very fundamental problems of theology and liturgy which the design of a church inevitably involves. The liturgical renewal on the Continent is not, as Mr. Mellor seems to suppose, a movement for 'pushing' a particular arrangement of church furniture—a sort of continental Warham Guild. It cannot be identified with a particular 'liturgical' plan. On the contrary, the architectural experiments which are among its most striking symptoms are of a quite remarkable diversity. What the liturgical movement *is* doing is rather to provide the radical theological thinking which is the first and indispensable requirement for the formulation of an adequate programme.

The Provost of Coventry's astonishing assertion, that anyone comparing the plan of the new cathedral with those illustrated in my article 'will see that it compares favourably with them,' seems to me sheer wishful thinking. It is *not* self-evident that a long, narrow, rectangular plan provides the most satisfactory architectural expression of the biblical and patristic—not to say Anglican—conception of the eucharistic action, however admirably it is adapted to the clericalized liturgy of the high middle ages: as at Albi, for example. Far more is involved than the ability to see a distant altar. The avowedly medieval sources of Professor Spence's inspiration are extremely significant in this context.

I would agree with the Provost that many of the works of art which are to find a place in the cathedral are likely to be a source of inspiration to those for whom ecclesiastical art is commonly associated with sham-Gothic horrors. Whether their teaching value will prove to be as great as he supposes is another matter. Much of the symbolism seems to me to be far too subjective, insufficiently informed by any real grasp of theological and liturgical principle. The function of sacred art involves a great deal more than the provoking of an aesthetic *frisson*. Again, the failure is largely the result of inadequate briefing. General statements of principle are not enough. What is required is a labour of systematic rethinking and research comparable to that which has been carried out since the war in the field of school building. This is likely to prove a considerable undertaking calling for collaboration between experts in many different fields: theologians, architects, sociologists and parish priests, to mention only a few. It is a task which we have as yet scarcely begun to tackle on this side of the Channel. I hope that the next few months may see a modest step in the right direction with the formation of a church architecture research group, but we desperately need some kind of centre with the means for promoting research of this nature. Such institutions abound on the Continent and their work is proving quite invaluable.

Coventry cathedral may well prove to be a kind of English Assy—both as regards its virtues and its limitations. Let us hope that, like Assy, it may lead to an Audincourt.

MEMORIAL

Wells Coates

As a founder member of the MARS Group, and the designer of the first modern block of flats in London, Wells Coates has a secure place in the history of the Modern Movement in England, and his recent death in Vancouver at the age of 62 has robbed British architecture of one of its most distinctive and original minds. He had a wide—indeed world-wide—education, having been born in Japan and graduating from McGill, and he brought to problems of planning and structure a kind of ingenuity and logical method that had more in common with his French than his English contemporaries, and ideas of economy that he himself used to refer back to his early experiences of the architecture of Japan. He became one of the most characteristic figures of the intellectual life of the Thirties—Lawn Road Flats, which he built for Jack Pritchard and soon became a regular roosting-place for migratory architects, had exactly that blend of alert sociology and advanced abstract aesthetics that trade-marked the epoch. His later block of flats in Princes Gate was less tough-minded to outward view, but more ingenious in both structure and in the planning (or, rather, section) of the apartments. Ingenuity of section was a notable feature of his most noticed post-war building, the Telekinema for the Festival of Britain, with its projection booths in the thickness of the balcony. Most of his energies since the war, however, were devoted to town planning in Canada, where he tended to spend more and more time in the last years of his life. Many legends gathered around his name, as is so often the case with pioneers, but students who consulted him on points of architecture or recent history, found—not an irascible eccentric—but a man of forthright, well-reasoned and firmly-held ideas, and a sympathetic hearing for their own views.

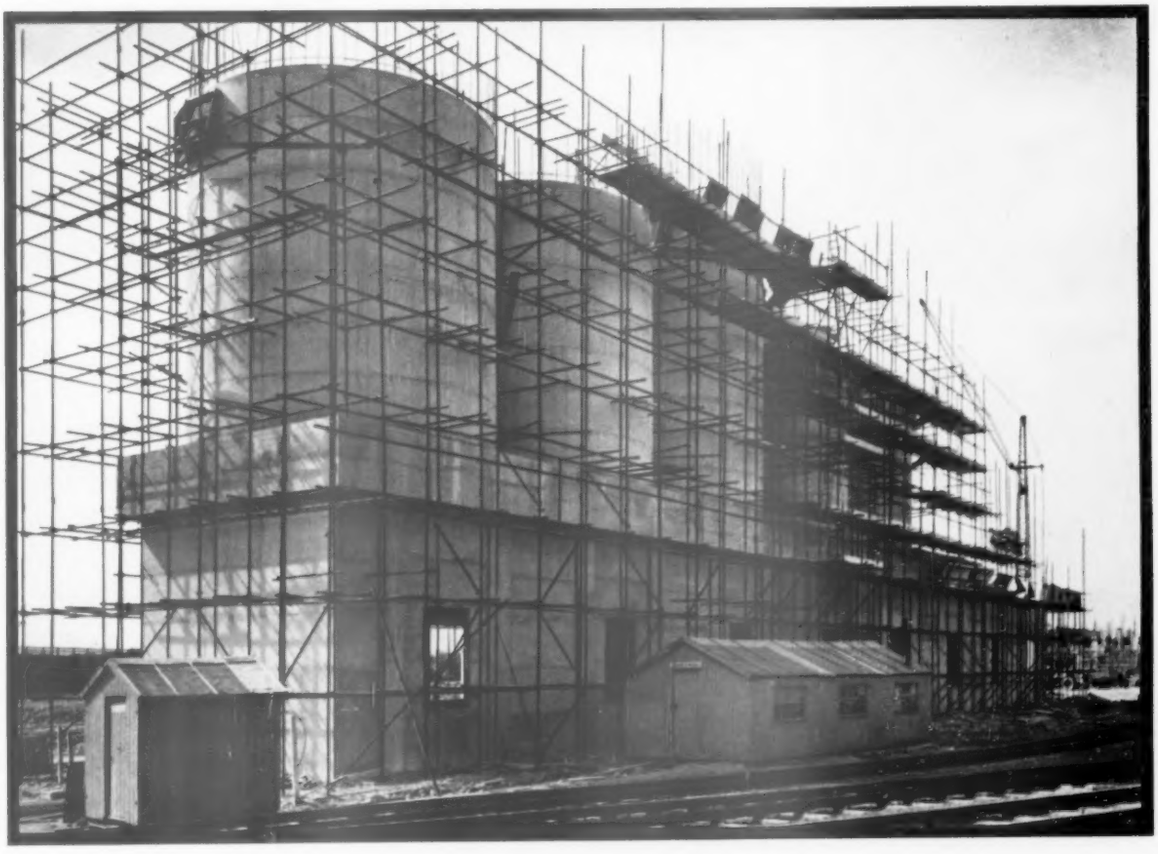
INTELLIGENCE

The Government have agreed to contribute up to £250,000 over ten years for the repair of historic buildings in Oxford, provided that the Trustees can raise £1,500,000. Grants for individual college buildings will be made by the Minister of Works, on the advice of the Historic Buildings Council.

ACKNOWLEDGMENTS

MARGINALIA, pages 71-72: 5-7, Chuji Hirayama; 8, Robert D. Harvey Studio. EXPO 58, pages 75-140: page 79, bottom right and left; page 83, bottom left and centre; page 95, middle right; page 97, top; page 104, 12; page 109, 21; Sam Lambert; page 88, bottom, Sado Bruxelles; page 89, top right; page 90, top left, Fox Photos; page 106, 18; page 109, 22; page 114, 40, 41; page 118, 46, Browne Arphot.

Construction in progress



Blending Bunkers at Murton Coking Plant of the National Coal Board, Durham Division.
(Photo reproduced by permission of N.C.B.)
Main Contractors: Woodall-Duckham Construction Co. Ltd.
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MARLEY at Brussels

A corner of the United Kingdom Government Pavilion showing the Marley Tile floor. (This photograph was taken in the evening when the Pavilion is closed down. During the day the entire floor area is thronged with people.)

Architects:
Howard V. Lobb, C.B.E., F.R.I.B.A., A.I.Struct.E.
John Ratcliff, O.B.E., F.R.I.B.A., A.M.T.P.I.
Display Designer: James Gardner, O.B.E., R.D.I.

In the first six weeks of the Exhibition three-quarters of a million people have walked over the Marley Floor Tiles laid in the Government Pavilion and Crystalline Hall. After cleaning each night they look as good as the day they were laid. By the time the Exhibition closes some 3½ to 4 million people will have walked over this Marley floor — and it will still look all that a good floor should — equal to 60 years of heavy commercial wear.

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THE ARCHITECTURAL REVIEW

Volume 124 *Number 739* *August 1958*

SPECIAL ISSUE: THE BRUSSELS EXHIBITION

Edited and written by J. M. Richards

Photographs by de Burgh Galwey *Drawings by Kenneth Browne*

The Cover is a close-up from beneath the metal drum, open to the sky, in the centre of the roof of the United States pavilion, and its surrounding translucent ceiling of wire mesh. It is one of several ambitious and ingenious roof structures that are the Brussels exhibition's chief contributions to building technique and are the subject of an article beginning on page 133.

SUBSCRIPTION RATE: The annual post free subscription rate, payable in advance, is £3 8s. 0d. sterling, in U.S.A. and Canada $10.50, in Italy Lire 6940, elsewhere abroad £3 10s. 0d. Italian subscription agents: A. Salto, Via Santo Spirito 14, Milano; Librerie Dedalo, Via Barberini 75-77, Roma. An index is issued half-yearly and is published as a supplement to the REVIEW.

THE ARCHITECTURAL REVIEW

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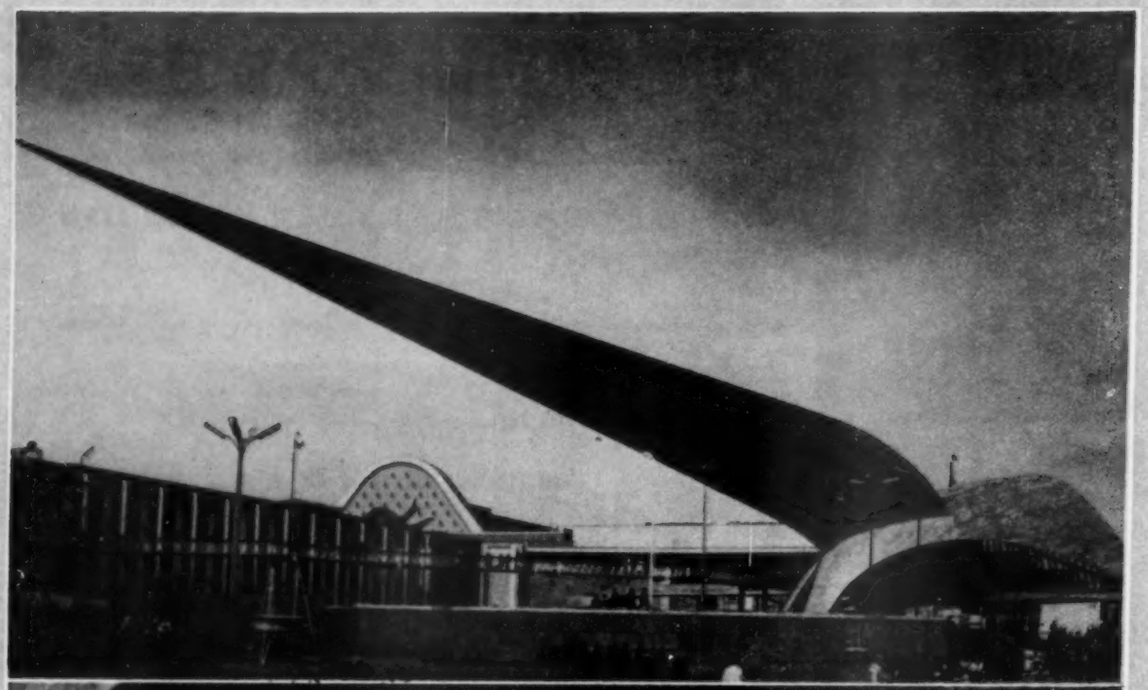
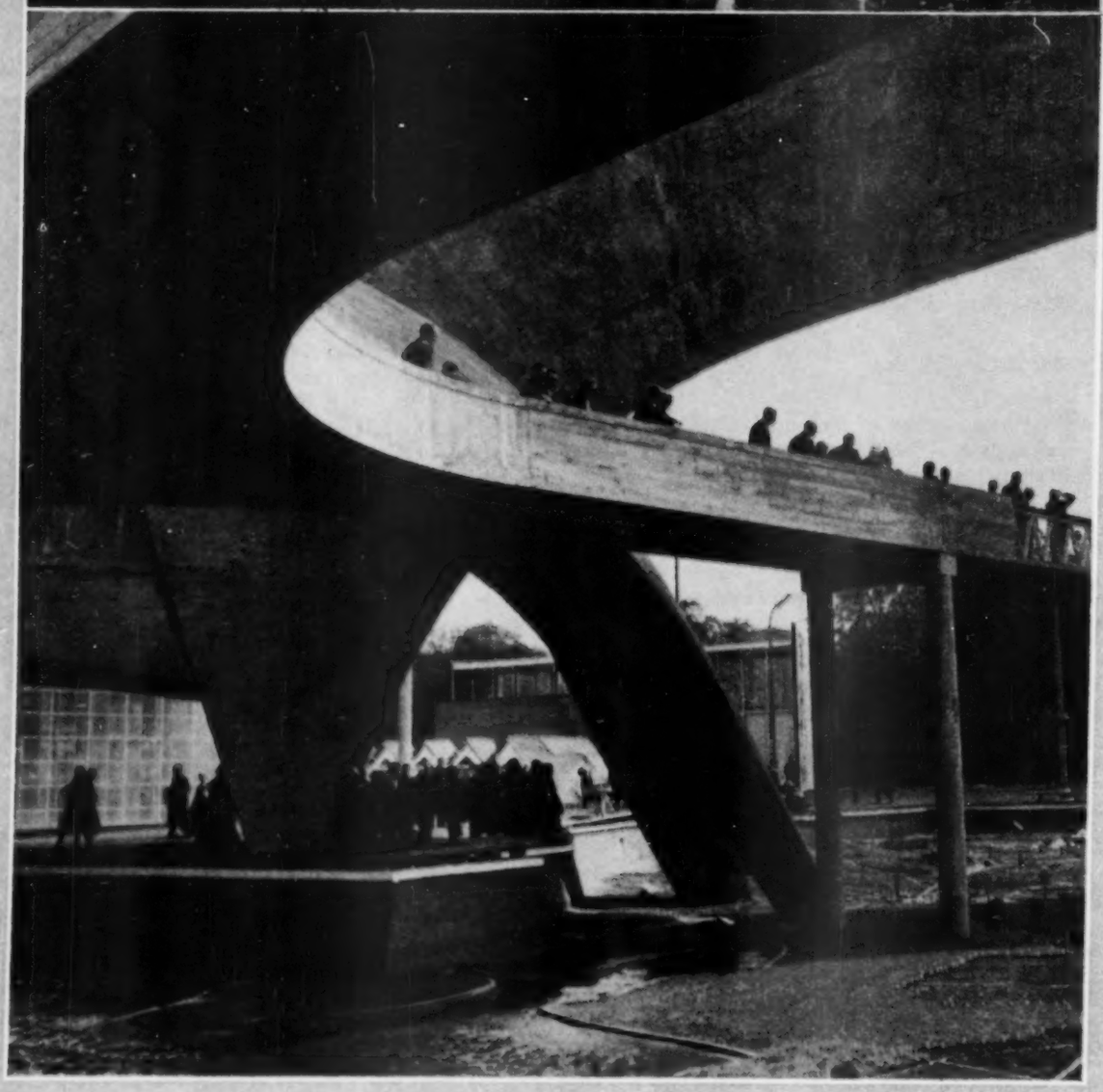
FIVE SHILLINGS





Belgium, the host country at the international exhibition to which this issue is devoted, has contributed one remarkable structure, a civil engineering exhibit designed to show off the possibilities of modern reinforced concrete construction. A pointed spear, top picture, is cantilevered from a hollow convex base and both are poised above a huge relief map of the country (bottom picture) showing among other things the new system of major motorroads which visitors to the exhibition should take the opportunity to admire. *See also page* 80.

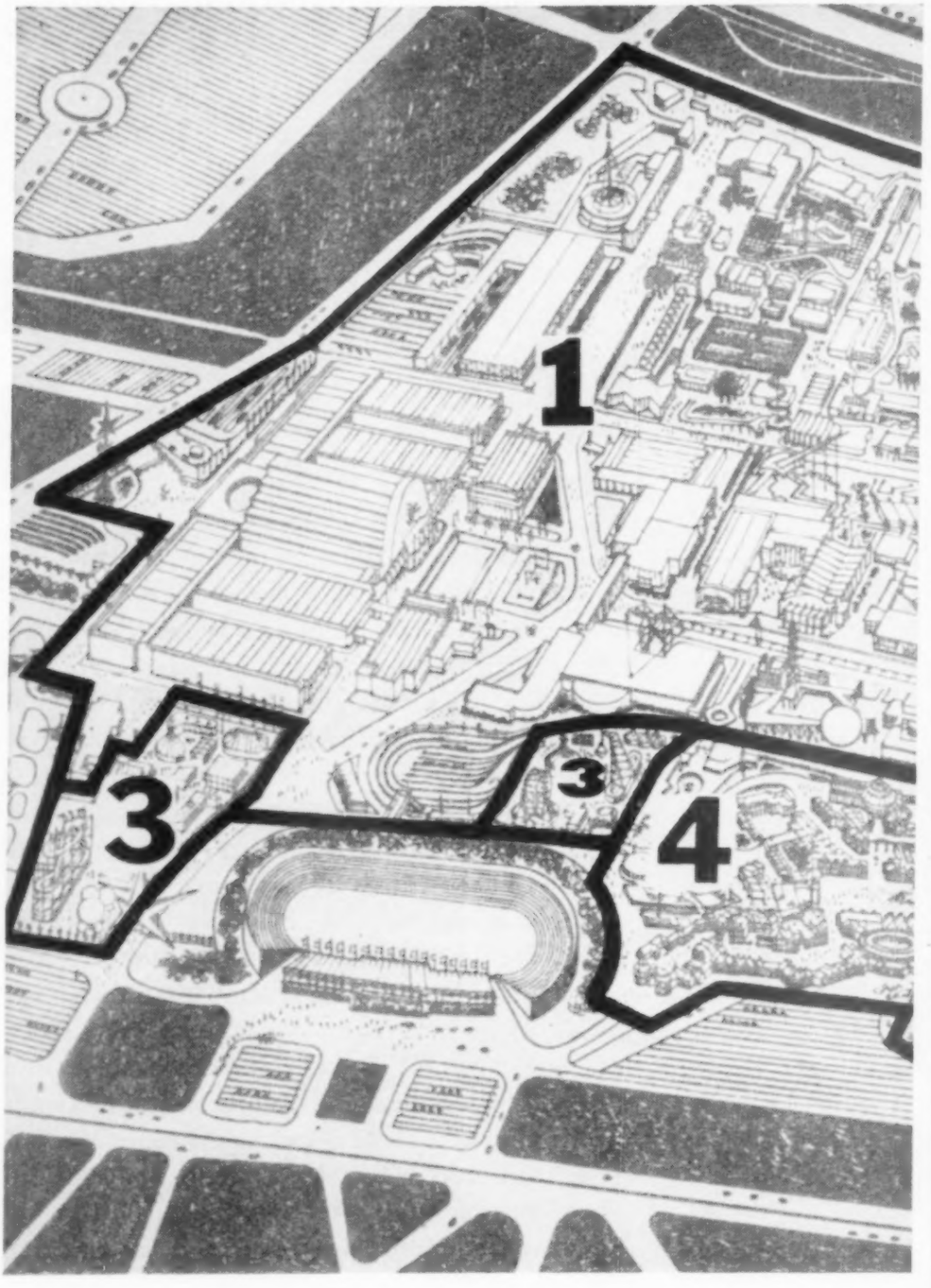
EXPO 58

Exhibitions have much more than an entertainment value. To architects they present an opportunity of, as it were, flexing their muscles in public and showing what feats they are capable of when uninhibited by the responsibilities of permanence; to the public they offer an experience of a world where everything is modern. And in the grounds of an exhibition the public approaches a building with fewer preconceptions about what buildings ought to look like. There is therefore, or should be, some useful *rapprochement* between modern architecture and its public, which is endangered only by the fact that exhibition buildings are, by their nature, somewhat fantastic and showy, and the public's erroneous impression that outrageous constructions and outlandish forms are what modern architecture is all about may be confirmed by what it sees there.

At the Brussels exhibition—known locally as Expo 58—there is a good deal of this, and who can say whether it is a reflection of a tendency among contemporary architects to over-indulge in structural acrobatics or whether it should be tolerated as the emphasis on showmanship proper to exhibitions? Some of the acrobatics, especially in the shape of roof-structures, have nevertheless their own interest and value, and are the subject of a technical article at the end of this issue. Apart from these, the predominance of the glass-box-curtain-wall theme suggests that Brussels is not one of those exhibitions to which history will look back as the starting point of some new stylistic trend or as the occasion of important experiments.

Other exhibitions have played this role and exerted a lasting influence while doing so, the classic example being the Stockholm exhibition of 1930, which is one of the major landmarks in the history of modern architecture. Similarly the 1951 Festival of Britain is a landmark as regards this country. While it contained little that was revolutionary, it offered the British public, which had previously seen modern buildings only as isolated objects in confused and unsympathetic settings, its first experience of an environment created wholly in the spirit of modern architecture. What had been a specialist taste in architecture, furniture and so on became, after 1951, popularly acceptable and commercially saleable, and many recent improvements in everyday design—for example in café furniture and display lettering—are due to the example set on the South Bank.

The style of design that predominates at Brussels has less to contribute to the evolution of modern architecture, since the ideas displayed there are now freely accepted; indeed they largely consist of the ideas with which modern architecture is most closely identified



LAY-OUT PLAN

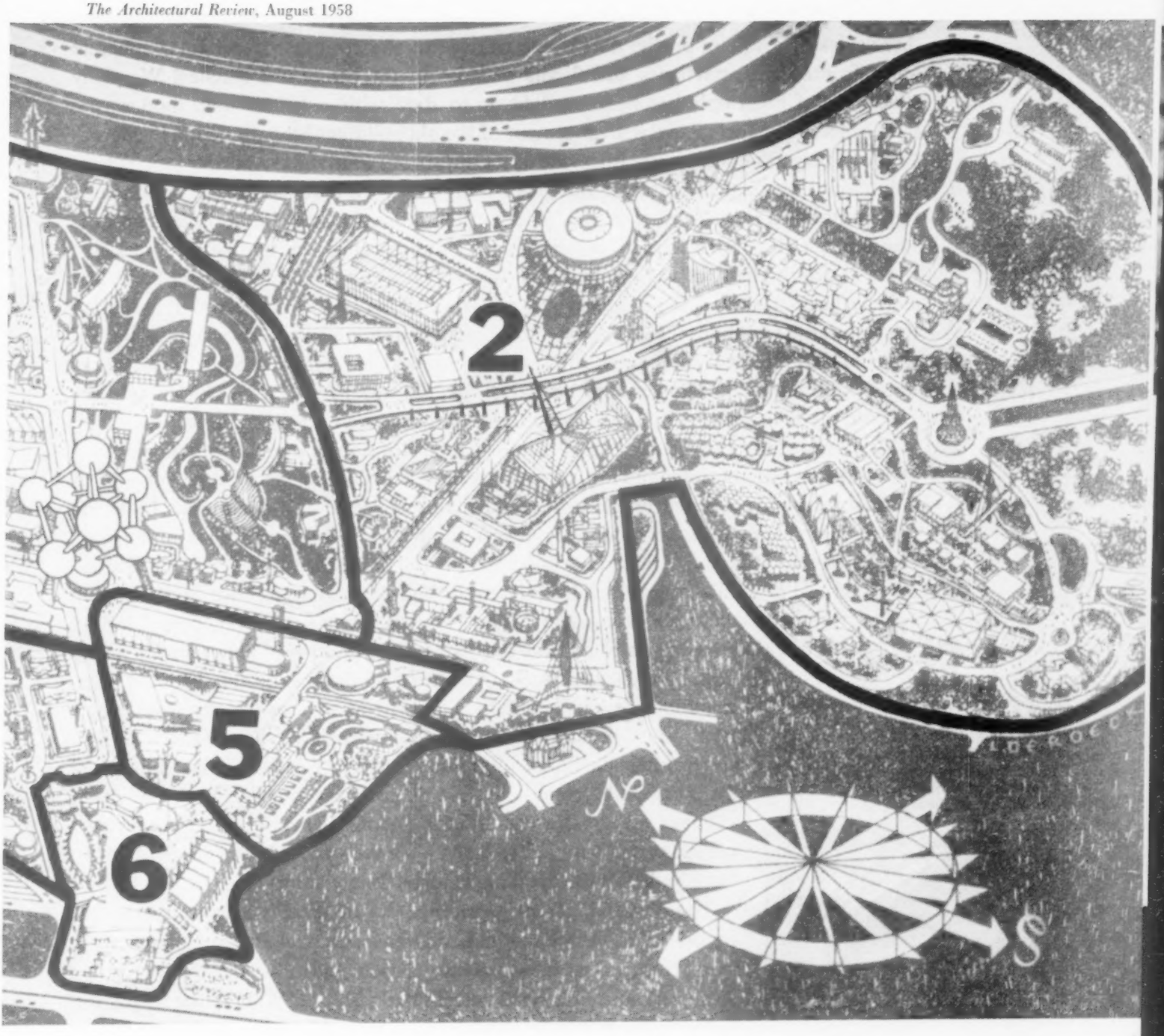
1. The Belgian section.
2. The foreign section.
3. Amusement park.
4. "Belgique Joyeuse": reproduction of the centre of an old market-town.
5. The Belgian Congo and Ruanda Urundi.
6. The international section.

Across the top of the plan can be seen the new double-track Brussels—Antwerp highway with its flyover crossings, etc. In the bottom left-hand corner is the Heysel sports stadium. The symmetrical group of buildings within the left-hand boundary are those that survive from the Brussels exhibition of 1935. *The plan of the foreign section (the right-hand portion, crossed by the high-level* passerelle) *is shown in more detail on page* 86.

Chief architect for the exhibition, M. Van Goethem (successor to P. Bonduelle, originally appointed chief architect, who died in 1955 *when the planning of the exhibition had only just begun). Chief engineer, E. Valcke. Garden architect, R. Péchère.*

in the public mind: smooth expanses of glass; buildings raised on stilts; exposed metal frames; stairs without risers; together with all the clichés that the designer who wants to be up to date has taken over from the technologist, by whom they were conceived as tools rather than as effects. So ubiquitous are certain familiar forms, like the exposed steel frame clad with curtain walling—the glass box—that it may be predicted that if the exhibition has any influence of a general kind, the form it will take will be to hasten the decease of the glass box as the accepted pattern of modern building. It is utilized *ad nauseam*, and its limitations are exposed as fully as its potentialities are exploited.

This is truest of the Belgian sections of the exhibition, a large part of the whole, where not only are the buildings (with the few exceptions noted on the next few pages) composed of cliches; they are themselves clichés, and since the purpose of this issue is to



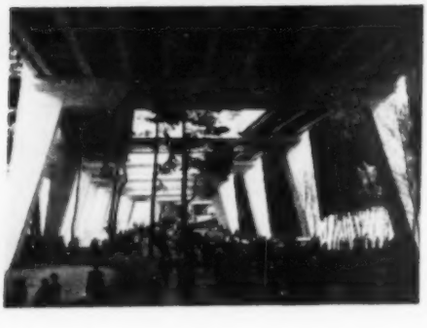
put on record the good things to be found at the exhibition, the greater part of it is devoted to the foreign section where the best buildings (glass-box-wise and otherwise) are gathered together, and which is also the most rewarding section for the pursuit of good detail and well-conceived example of townscape and trim—these being other fields in which exhibitions have, in the past, served the useful purpose of trying out and disseminating ideas. A separate section of this issue is devoted to details of this kind.

Before close attention is paid to the foreign section, something must, however, be said about the exhibition as a whole. The site is one of about 500 acres on the northern outskirts of the city, twenty minutes away by tram. It is the same site—or, rather, an extension of the same site—that was used for the exhibition of 1935, and part of the Belgian Government exhibit is installed in the surviving 1935 buildings placed round

three sides of a square on the north-western edge of the grounds: rectangular concrete halls, fronted with porticoes and flights of steps in the heavy neo-classical Wembley style. One of them only has been brought up to date with a bright blue modernistic frontispiece. The formal, axial arrangement of the old buildings is continued in the new in so far as they are lined up on either side of a number of radiating avenues, creating vistas duly closed by vertical features. But this boring type of layout does not, fortunately, impose itself on the whole exhibition. Much of the ground, especially in the east and the south-east (where the foreign pavilions are situated), has an undulating park-like character, with plenty of well-grown trees. It was indeed originally the Heysel Park, and adjoins Laeken, one of the Belgian royal estates. This landscape has been well used, and the picturesque qualities thereby given to the layout fully compensate, over a great part of the exhibition, for the absence of those natural sheets of water—the Seine at the many Paris exhibitions, the Thames at the South Bank, the water-front at Stockholm and the harbour at Hälsingborg in 1955—which have proved such an asset in the past.

This beautifully formed landscape has permitted not only a more informal grouping of buildings and the introduction of such devices dear to the Picturesque planner as concealment and surprise, but also continual changes of level in the pathways by which the pavilions are approached, giving a refreshing variety of view. This quality has been intensified by one bold addition to the natural landscape: a pedestrian viaduct, about a third of a mile long, which leads from the high ground at the edge of the Laeken park, crosses the valley in which the biggest foreign pavilions are sited and swings westwards and downwards on to another ridge of high ground running from the north-east boundary towards the centre of the exhibition. From it commanding views are obtained, down on to crowded avenues, pools and fountains and the roofs and terraces of pavilions, and obliquely over other pavilions glimpsed distantly between trees. Flights of steps descend from it at several points to connect with the lower avenues and pathways. It is an admirable conception, though its concrete structure is too heavy to give it the inspiring scale it might have had, and the detailing is forbiddingly clumsy.

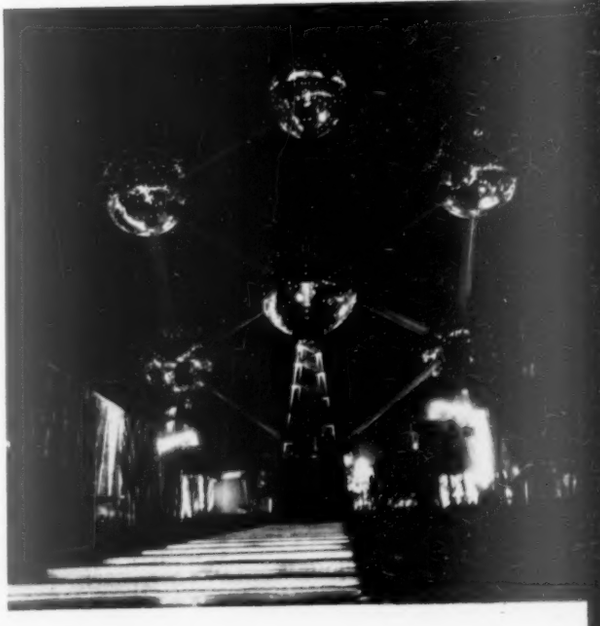
The pedestrian overpass or passerelle which crosses the foreign section. In the top picture the aerial tramway is seen passing beneath it and continuing alongside the Vatican restaurant beyond. In the bottom picture the little Siamese pavilion can be distantly seen on the right.

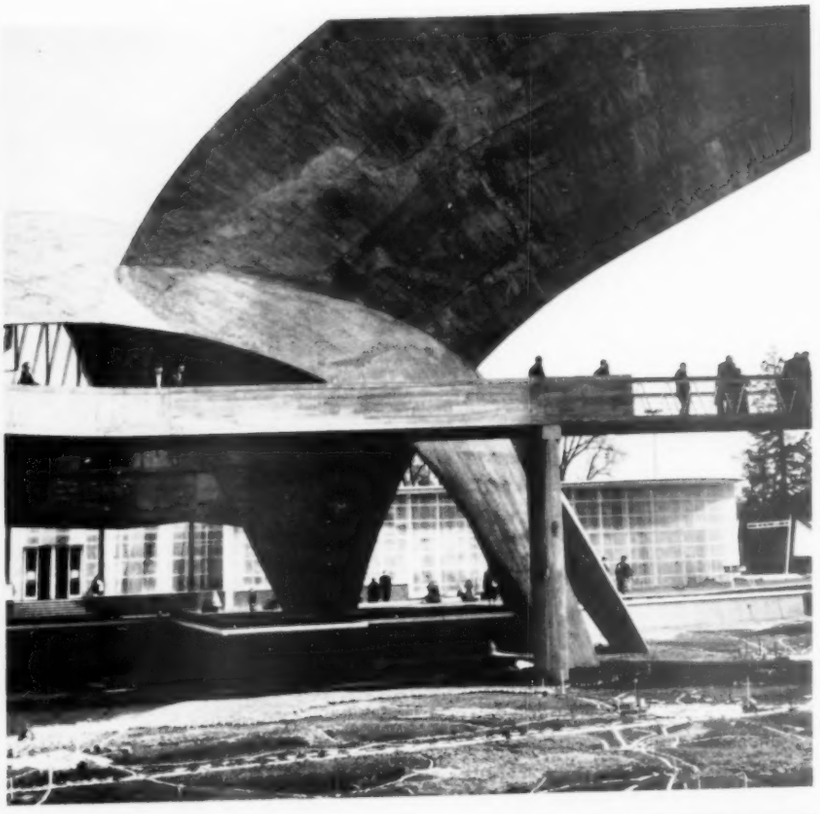


The drama inherent in multiplicity of level is also well exploited by one of the three methods of transport available to visitors to the exhibition: an aerial tramway, constructed after the fashion of an Alpine ski-lift. Overhead wires, strung on branching concrete pylons, carry gaily-coloured metal tubs, each holding two people, between elevated stations at several points in the grounds—see map on page 81. The wires pass under the aforementioned pedestrian viaduct (or *passerelle*), sometimes higher than the roofs of buildings (though not directly above them, since the routes follow the main avenues) and sometimes alongside them, so that the occupants of the tubs can peer from a high level through their curtain walls. These rides have no great utility as a means of transport, since the distances they convey their passengers are short, but they add greatly to the gaiety and the three-dimensional complexity of the scene, they provide exciting and unexpected moving viewpoints and they also provide the refreshing experience of temporary isolation from the pushing,

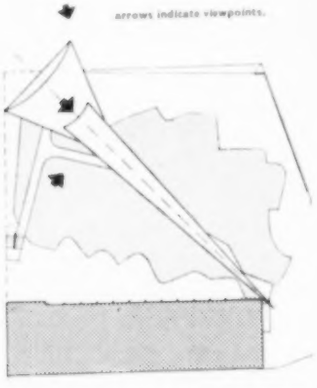
The exhibition's central feature, the 360 ft. high 'atomium,' is an enlarged model (165 million times) of a molecule of iron. It consists of nine spheres: one at the base, on which the structure rests, one in the centre, one at the top and two circles of three spheres each. It is given additional stability by steel bipod legs (small picture on left) reaching from each of the three lower spheres to the ground, housing staircases for descent. Ascent is by a central lift shaft, and by escalators (lower picture on left) connecting the base sphere with one of the lower circle of spheres and this with the centre sphere. The top and centre spheres are divided internally into two floors, each with a circle of windows, the lower floors being viewing platforms and the top floors a restaurant and a bar respectively. The structure generally, and the tubes that connect the spheres and contain the lifts and escalators, are of steel. The spheres are clad in aluminium alloy, with an outer layer of highly polished aluminium foil. Between spheres and tubes are rubber mountings to take up differential expansion. The aluminium cladding of each sphere consists of narrow bands forming nine great circles, dividing the surface into forty-eight spherical triangles which are themselves each sub-divided into fifteen triangles. The bands and triangles (which are visible in the top picture) are bolted to a light aluminium frame. Into the triangles small lights are recessed—see the night view on the right.

Architects, A. and J. Polak; engineer, A. Waterkeyn.



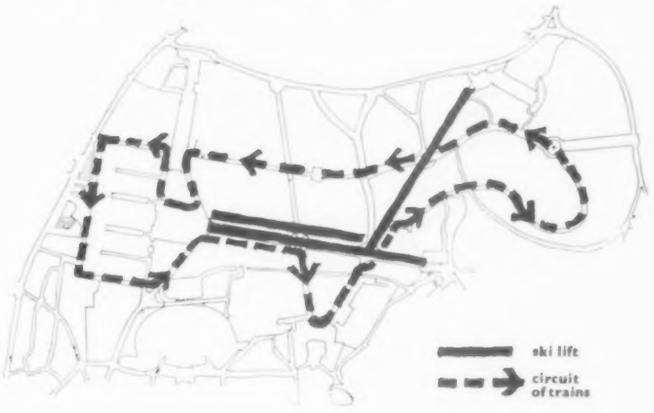


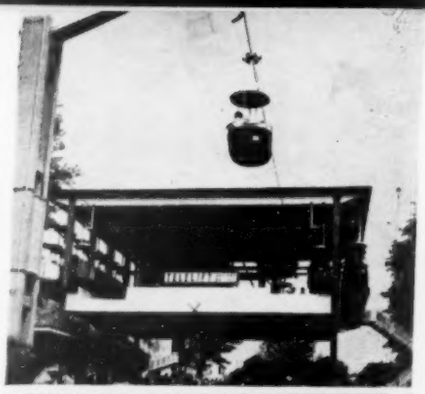
The civil engineering exhibit (see also frontispiece) is in the centre of the Belgian section, due north of the atomium, towards which the reinforced concrete spear points. This spear is cantilevered over a relief map of Belgium (shown top right and shaded in the plan below) and from it is suspended a gangway (see picture above) leading to the main rectangular exhibition hall



(shaded darker in plan). The spear (an inverted A in section) springs from a domed concrete hall (right-hand pictures), the floor of which is cantilevered away from a central pivot in the opposite direction from the spear. Together with two stilts continuing the curve of the dome, this pivot furnishes a tripod support for the whole structure.

Architect, J. Van Doosselaere; engineer, A. Paduart.





Left, the exhibition grounds showing the routes of the aerial tramway (or ski-lift) and the ground-level trains of cars. In the centre is the atomium. On the right: top, a ski-lift tub arriving at one of its terminal stations; centre, tricycle taxi; bottom, train of cars (atomium in background).

chattering crowds. The other two means of transport are two-seater motor-tricycles that can be hired by the half-hour like taxis, and trains of open-sided cars, painted blue, following fixed routes.

The other structure which occupies the sky and dominates over the *passerelle*, the ski-lift, the high roofs of the bigger buildings and the many smaller vertical features—and indeed which presides grandly over the whole exhibition grounds, in most of the near and all the distant views—is the 'atomium,' the exhibition's symbolic central feature (see page 79). It has defects as a design, but must yet be counted a success, if only because its great bulk (it is 360 ft. high) creates a genuine sense of drama when it is seen from underneath and because the shining surface of the aluminium alloy with which it is sheathed glitters prettily among the trees and can look beautiful, mysterious and even sinister when the sky behind it is dark in tone. Its principal defects are first its somewhat ungainly proportions, due to the fact that the tubes that connect the spheres have been made larger than structural considerations demanded, in order to give room for escalators inside them, and secondly the imprecise quality of some of the detailing. The atomium is placed at the intersection of four main avenues, one of which has a cascaded pool of water rippling down its centre. The whole area between it and the formal group of 1935 buildings already mentioned (that is, the north-western half of the grounds) and the area east of this, up to where the exhibition comes to an end alongside the new Brussels-Antwerp highway, constitute the Belgian section. Here are buildings devoted to industries and government undertakings (metallurgy, hydraulic energy, forestry, telecommunications and so on) together with a few exhibits by commercial and industrial firms.

Few of these buildings are of any architectural interest, the outstanding exception being the civil engineering exhibit (see frontispiece and facing page), which consists of a fairly conventional two-storey hall alongside which is a spectacular structure in reinforced concrete containing a smaller exhibition hall within its base but chiefly designed to display the potentialities of its material. A pointed triangular spear in the form of a cantilevered arm rises steeply into the sky and from it is suspended a gangway which leads visitors to the upper level of the main hall. The whole composition—the soaring arm, the exhibition chamber at its base, its supports, ramps and staircases—has been designed with real sculptural feeling. Apart from its didactic purpose it is, from every viewpoint, a strikingly dynamic object. On page 83 are illustrated two or three

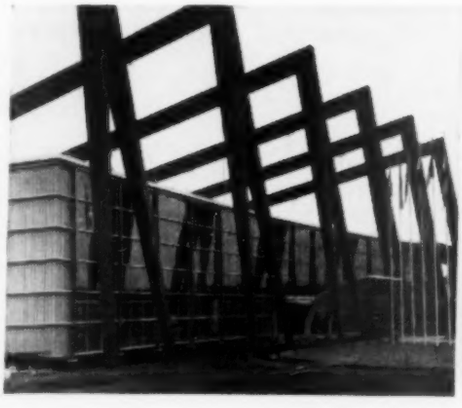
In the section entitled 'Belgique Joyeuse,' a reconstruction of a traditional market-square. Architect, Y. Blomme.

other buildings in the Belgian section which also show some architectural quality.

West of the Belgian section, in the corner of the grounds, are a helicopter station and the amusement park. On the other side of the Heysel sports stadium is a small area given to an exhibit of the kind that all exhibition organizers feel compelled (and find it profitable) to provide: a traditional Belgian market-square with the surrounding houses and adjoining streets meticulously reproduced as they would have looked in 1900, and embellished with peasant costumes, folk cookery, local handicrafts and the like. The popularity of such sideshows among the less sophisticated visitors is the organizers' answer to the scorn poured on them by those who find them only sentimental. This example is efficiently and picturesquely done.

Alongside it, immediately south of the atomium, occupying the angle between two important avenues, is the area given to the Belgian Congo and Ruanda Urundi. Although the story of their flora, fauna, mineral wealth and missionary enterprises have their own importance and are properly told in some detail, neither the style in which the exhibits are displayed nor the buildings that contain them are of interest, and so need not be dwelt on here. The same must regretfully be said of the international section, situated south-west of the atomium at the point where the two avenues bounding the Congo section converge. It is the first time that the international organizations have been catered for in an exhibition like this. Pavilions devoted to the United Nations, the Council of Europe, Benelux, OEEC and ECSC are symmetrically grouped round a large courtyard. This could have been a highly significant development calling for and creating an appropriate architectural impact. Disappointingly, this group of large buildings makes hardly any impact. Except in the Council of Europe building the displays contained therein are uninspiring, and the architecture, though an attempt has obviously been made to create a monumental version of the contemporary exhibition idiom with the aid of striking modernistic roof-structures, is utterly sterile. It illustrates the paradox that designs representing an abstraction and emanating from a source as impersonal as a committee seem to turn out to be the most elaborately self-conscious.

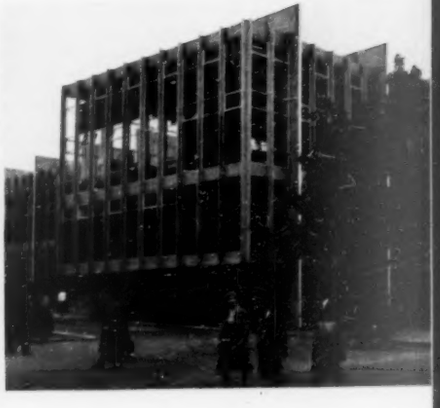
On the opposite side of the atomium to the Congo and international sections, stretching north-eastwards, like the Belgian industrial section, as far as the Brussels-Antwerp road, there is hilly, thickly wooded ground, cut up by narrow lakes and deep ravines, which provides a refreshingly calm green contrast to the glitter and garrulity of the

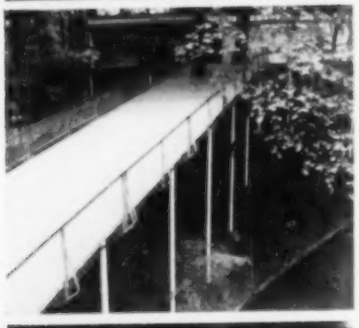


In the international section: left, the CECA (European Iron and Steel Council) building (architects, E. Delatte and R. Maquestieau); right, the United Nations building (architect, H. van Kuyck). The roof of another of the buildings in this section—for OEEC—is described in the technical article beginning on page 133.

The Philips pavilion, above, housing a *poème électronique*, adjoins the Netherlands pavilion in the foreign section. It is a reinforced concrete rib structure, with a freely curved plan shape (plan on right), determined by acoustic and lighting requirements, rising to three peaks of 65 ft., 60 ft. and 42 ft. The structure is clothed with a concrete envelope formed of twelve hyperbolic parabaloids and consisting of thin slabs laid on pretensioned cables anchored to the ribs. The inner walls are lined with sound absorbent material and have three hundred loudspeakers built into them. *Architect, Le Corbusier; engineer, H. C. Duyster.*

Below, three of the more successful buildings in the Belgian section. Left, glass-walled showroom of International Business Machines (*architects, E. Noyes and A. and J. Polak*) and cylindrical display by the electronic industry (*architects, J. Thiron and J. Wybauw*). Centre, mining pavilion, sheathed in copper, in the Congo section (*architects, Delcourt and de Nayer*). Right, Government research building with exposed frame of polished timber (*architects, M. Lambrichs and P. Dumont*).





This restaurant, the *Pavillon du Champagne*, is part of a group of buildings devoted to French foods and drink in the thickly wooded area bounded by the northern part of the foreign section, the Brussels-Antwerp highway, the avenue leading from the atomium to the *Porte de l'Atomium* and the pathway that continues the line of the *passerelle* after it touches ground at its western end. The long narrow building is enclosed by trees and spans over a lake (top picture above). Here a lower floor is fitted between the steep banks on either side (top right). The several entrances to the restaurant are reached by boarded walkways (above) perched over the shores of the lake and in one case passing first beneath a bridge (right) which takes one of the avenues over the lake. The building has a simple timber frame, painted white, with large windows from floor to ceiling.

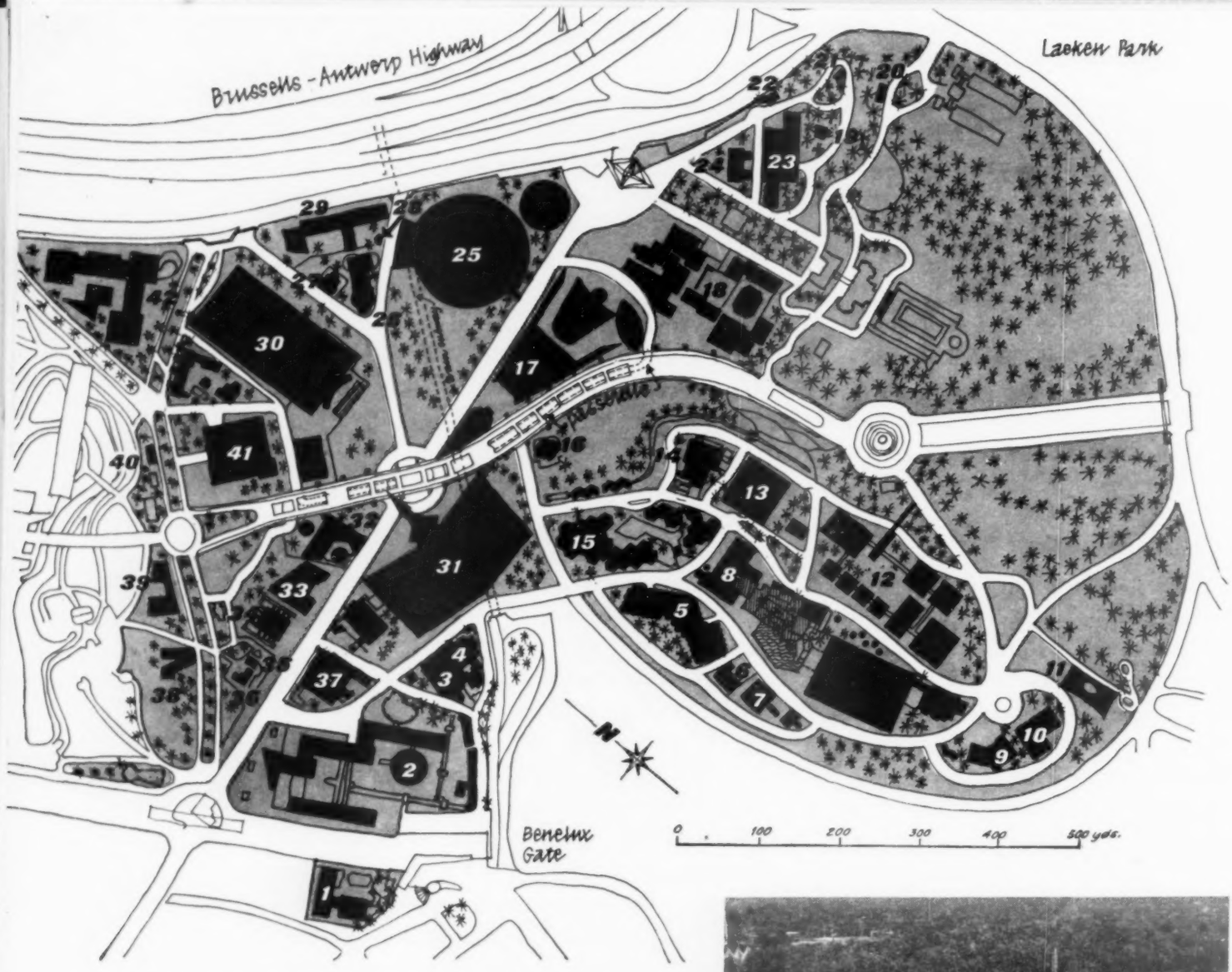
crowded avenues. This area is sparsely built on, but contains one of the most successful buildings outside the foreign section—successful not on account of any originality of its architecture but because of the skilful use it makes of the site and of its simple unassuming scale and proportions: a restaurant, to which is attached an exposition of the merits of French provincial food and drink—see facing page. The building—called the *Pavillon du Champagne*—is set astride the water and weaves its great length between the stems of trees. It is approached by bridges and causeways of a suitably robust rural character, but sensitively detailed and again making imaginative use of the landscape.

All the area east and south of this—about a third of the whole site—is occupied by the foreign section; that is, by the pavilions contributed by the forty-two nations participating, together with two or three additional small buildings (such as that of the International Red Cross). Of these latter the only one requiring attention in an architectural survey is the highly original structure—looking like a collapsed aluminized tent—put up by the Philips radio company. Though somewhat out of context, it is presumably placed here because the company is Dutch, not Belgian. It is, indeed, next door to the Dutch pavilion. The Philips pavilion aroused much interest in advance because of its designer—Le Corbusier. At the time of writing the *poème électronique*, devised by the architect to be exhibited inside, was not regularly on show. The outside is ingenious as an exercise in free architectural shape, but the relationship between shape and structure is not made clear enough for the exercise to be altogether successful. It is the type of structure that would be ten times as effective if it were only twice as large.

The greater part of this issue is devoted to the foreign pavilions, as being the most interesting buildings and the most productive source of townscape details, so nothing need be said about them here, except perhaps to make the comment* that the buildings which attain the highest standards of architecture and design are not always those best liked by the public, yet obvious popular appeal does not provide a justification for inadequate or commonplace design. The least worthy aim of an exhibition is to put forward already accepted standards—to rest on old and time-worn laurels. Its proper role is to earn new laurels by putting forward higher standards which, with the help of the impetus the exhibition itself gives, will come to be accepted one day. Criticism and discussion of exhibition architecture must bear this principle in mind.

* Also one other comment, which is not a matter of architecture but of policy. It concerns the British exhibit only. This is included in the architectural survey on the following pages, but attention must be drawn here to the fact that it is the only foreign exhibit which has given a large part of its space to a frankly commercial display of products. The British industrial pavilion is simply a hall in which the Federation of British Industries has sold space by the square yard to firms willing to put up their own stands. The result, in spite of much skill and ingenuity in the design of the stands, is as chaotic as the British Industries Fair—which it closely resembles—and strikes an altogether inappropriate note in an exhibition whose purpose is not the direct sale of goods. Britain has been much criticized in Brussels for this commercial approach to the opportunities the exhibition offered, and loses prestige thereby. Britain did the same thing at the Brussels Exhibition of 1935, and THE ARCHITECTURAL REVIEW played a leading part in a campaign against such a narrowly commercial policy. As a result a big step forward was made at the Paris Exhibition of 1937 and the New York World Fair of 1939, where Britain had a selective, officially sponsored, display of products like everyone else. Now Britain has stepped back again. Must it be said all over again that an international exhibition, where the nations compete to set the highest standards, is not the place for a commercial free-for-all at which the man who pays gets his goods shown? Rightly or wrongly visitors take these goods to represent the best Britain can make, and it is the Government's duty to make sure that they really do.

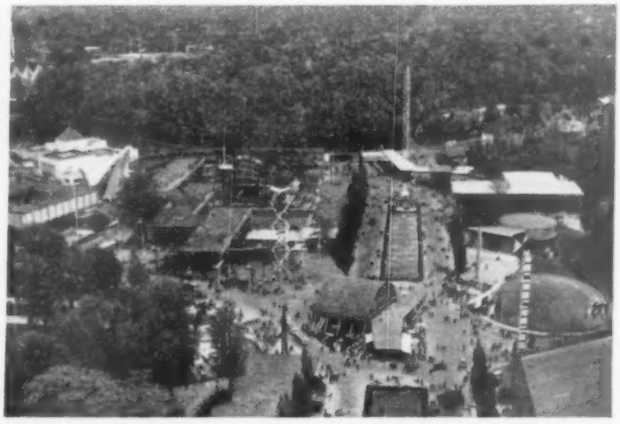
This is, one suspects, a failure of organization rather than of intention. This and other defects that have been apparent recently when Britain has represented herself inadequately abroad (or in some cases failed to represent herself at all) indicate an absence of direction that is perhaps inevitable when policy, and decisions about implementing it, rest simultaneously in the hands of the Central Office of Information, the Board of Trade, the Foreign Office, the Federation of British Industries and several other bodies, each guided by its own interests and prejudices. It is time the Government set up one responsible and far-sighted permanent commission and entrusted to it the task of formulating a positive British policy towards representation at exhibitions abroad.



THE FOREIGN PAVILIONS AND THEIR ARCHITECTS

The numbers on the plan and on the list below also indicate the itinerary the visitor can conveniently follow in looking at the buildings. The same itinerary is followed in the illustrated commentary that begins on the facing page.

1. Luxembourg
   R. Maillet and P. Reuter
2. The Netherlands
   J. H. van den Broeck, J. B. Bakema, J. W. C. Boks, and G. T. Rietveld
3. Tunisia
   V. Valensi and R. Bouraoui
4. Morocco
   A. Faraoui and H. Delval
5. Spain
   R. Vasquez-Moleron and J. A. Corrales
6. Monaco
   Ch. Gamba
7. Turkey
   U. Izzi, M. Türkmen, H. Sensoy and I. Türegün
8. Great Britain
   H. Lobb & Partners (Government pavilion and site architects), Royal College of Art, G. & U. Bowyer, E. D. Mills (Industrial pavilion) and James Gardner (chief designer)
9. Venezuela
   D. Savino
10. Mexico
    R. M. Alcerreca and P. Ramirez Vasquez
11. Brazil
    S. Bernades
12. West Germany
    Egon Eiermann and Sep Ruf
13. Portugal
    P. Cid
14. Jugoslavia
    V. Richter
15. Switzerland
    W. Gantenbein
16. Siam
    B. Sampatisiri
17. The Vatican
    P. Rome
18. Italy
    L. Belgiojoso, I. Gardella, A. Luccichenti, V. Monaco, E. Pereszutti, G. Perugini, L. Quaroni, E. Rogers and U. Sacco
19. Phillipines
    F. Gielush and E. S. San Juan
20. Cambodia
    A. Boudart
21. Ecuador
22. Dominican Republic
    A. Barrez
23. Japan
    K. Mayekawa
24. Iran
    A. A. Sadegh
25. U.S.A.
    E. D. Stone (interior by B. Rudofsky)
26. Egypt, Syria and Iraq
    Sayed Kerim
27. Sudan
28. Saudi Arabia
    Sayed Kerim
29. Hungary
    L. Gadoros
30. Russia
    Y. Abramov, A. Boretski, V. Doubov and A. Polanski (Y. Ratskevitch and K. Vassilieva, engineers)
31. France
    G. Gillet (P. Sonrel, consultant)
32. Argentina
    R. Quiroz and F. C. Sabate
33. Finland
    R. Pietilä (interior by Tapio Wirkkala)
34. Norway
    S. Fehn
35. Andorra
36. San Marino
    E. Stassin and L. Momoni
37. Austria
    K. Schwanzer
38. Liechtenstein
    B. Ospelt and H. Rheinberger
39. Israel
    A. El-Hanani and A. Sharon
40. Nicaragua
    A. Barrez
41. Canada
    Charles Greenberg
42. Czechoslovakia
    F. Cubr, J. Hruby and Z. Pokorny



Looking towards the foreign section from the top of the atomium. On the the right is the Benelux gate; centre-left The Netherlands ;left Austria, with the white-walled Tunisia and Morocco behind.

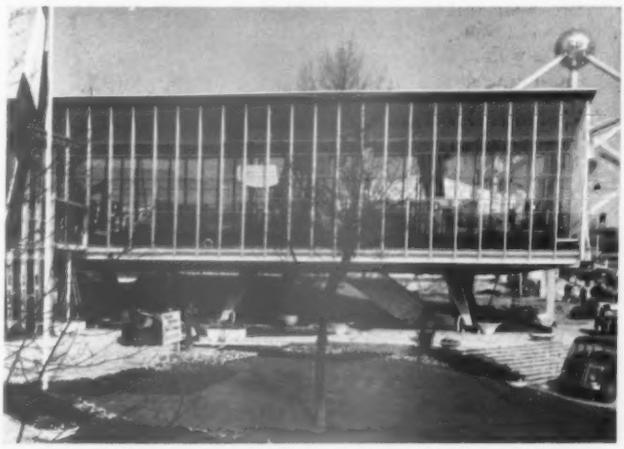
THE FOREIGN PAVILIONS

The foreign section, in the western part of the exhibition grounds, gains enormously from the beautiful landscaping that already existed in this area: undulating grassland, clumps of tall beech-trees and streams flowing through steep stony ravines. A ridge of high ground divides the pavilions of the forty-two participating countries into two main groups and two smaller ones at the northern and western corners. The high ground begins in the adjoining royal park of Laeken, and from this point starts the high pedestrian viaduct which crosses the foreign section and bisects the largest group of buildings. The foreign section is most conveniently reached from the Benelux Gate at its southern corner, which is also the nearest gate to the centre of Brussels. On the following pages the reader is taken on a pictorial tour of the foreign pavilions and given a commentary on their design; afterwards the six best pavilions architecturally—those of Germany, Holland, Yugoslavia, Spain, Switzerland and Japan—are illustrated more fully.

Immediately alongside the *Porte du Benelux* is Luxembourg, a steel-framed curtain-wall building like many others, but a neater and more elegant specimen than most, marred only by the rather heavy internal structure in the upper level exhibition hall (the lower level is a restaurant). It lights up well at night.

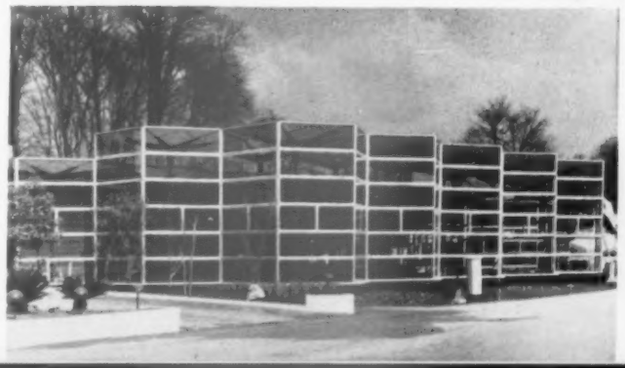
Facing the visitor as he comes through the gate is The Netherlands, one of the most ambitious of the foreign pavilions, and one that differs from most of the others in that, instead of being conceived as a container for the exhibits, the architecture is largely formed out of the exhibits themselves. They are arranged, some under cover, some in the open air, in a descending series of loosely planned courtyards, planted with grass and linked by brick-paved causeways. Pools with artificial waves form part of a demonstration of the technique of land reclamation, and reproduce in miniature the structure of the Dutch landscape. There are ships, an Archimedean screw and a lighthouse. Apart from the close integration of form and theme, giving the display a tough dynamic quality, the merits of the Dutch pavilion are its spacious planning, its use of levels, the vigorous handling of the materials used (except for some rather arty brick walling near the main entrance) and the robust but sensitive design of details like seats and flower-boxes, good examples of the functional tradition. The pavilion is more fully illustrated on pages 110–112.

Neither Tunisia nor Morocco, in the fanciful-reminiscent style, need detain the visitor. Passing them, he climbs a steep avenue with France (see page 96) towering up on his left and finds Spain, set against rising tree-planted ground, on his right. This is a cleverly worked-out building based on a hexagonal plan-unit, each of which is supported by a central steel column. This forest of columns, and the layers of clerestory lighting formed by stepping up the height of the units towards the centre, create an intriguing interior, which is almost empty. The display amounts to no more



1. Luxembourg
Main exhibition gallery from garden. The restaurant is on the left.

2. Netherlands
One of the courtyards, enclosed by glass-walled galleries. Beyond: shipping exhibit, with mast and lighthouse tower.

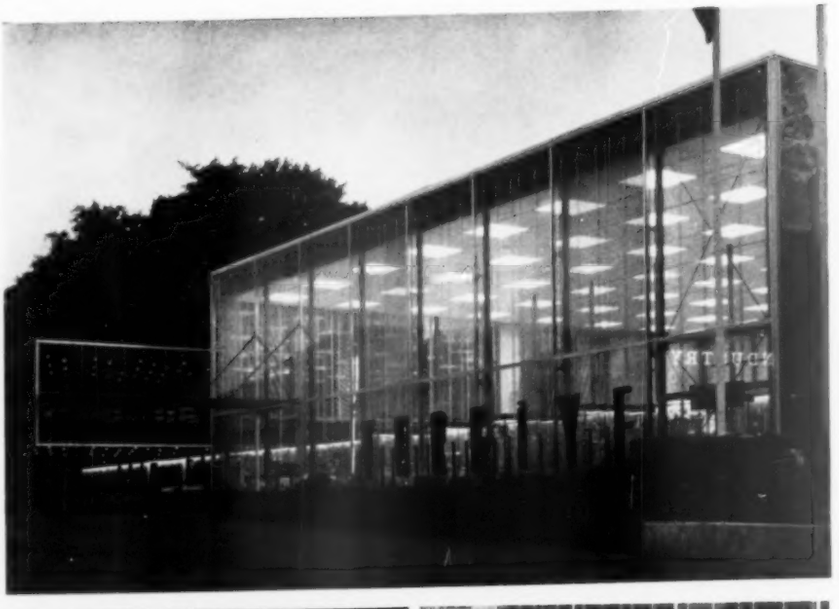


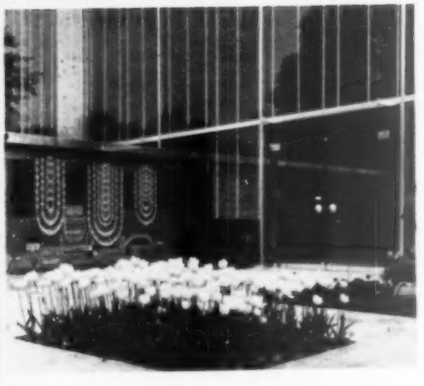
5. Spain
The fully glazed east façade, as seen from the British pavilion.

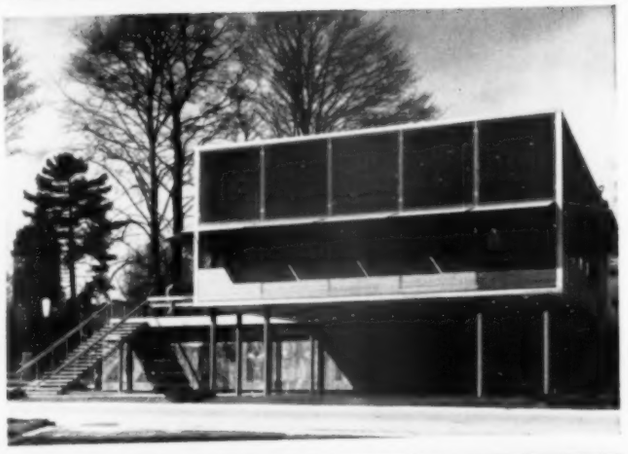
than a few enlarged photographs, and only when the raised stage is in use for an exhibition of Spanish dancing does the stepped interior (part of which is a bar and restaurant) come into its own as an auditorium. The hexagonal motif is repeated throughout the interior—in the café-tables, the horizontally displayed photographs and even the floor-tiles. Externally, the faceted walls are either of brick or of superimposed horizontal aluminium window-units. This Spanish pavilion, unexpectedly distinguished considering the conservative nature of most contemporary Spanish architecture, is also among those picked out for fuller illustration later (pages 112–117).

Next door to Spain is Monaco, which again deserves little attention. It is a moderately florid example of Riviera-modernistic, perched above a rock-garden, and has a minaret topped by a giant ceramic letter M. Beyond it again is Turkey—another very successful building, surprising for the same reason as Spain. The main pavilion is simply a cube of glass curtain-walling supported on a charmingly elegant and unobtrusive steel frame. Penetrating this at the side, where the entrance is placed, is a long wall bearing coloured mosaics. In front is a planted terrace. The displays and exhibits behind the wall are spaciously set out, but conventional in character. At the end

plan of the British pavilions.







7. Turkey
Top, at night—restaurant building on left. Centre, mosaic wall (by R. R. Eyuboğlu) from inside and outside. Bottom, the timber-screened restaurant.

8. Gt. Britain
The triple-spired Hall of Tradition from across the pool. On the right, open-air exhibits among the trees.

8. Gt. Britain

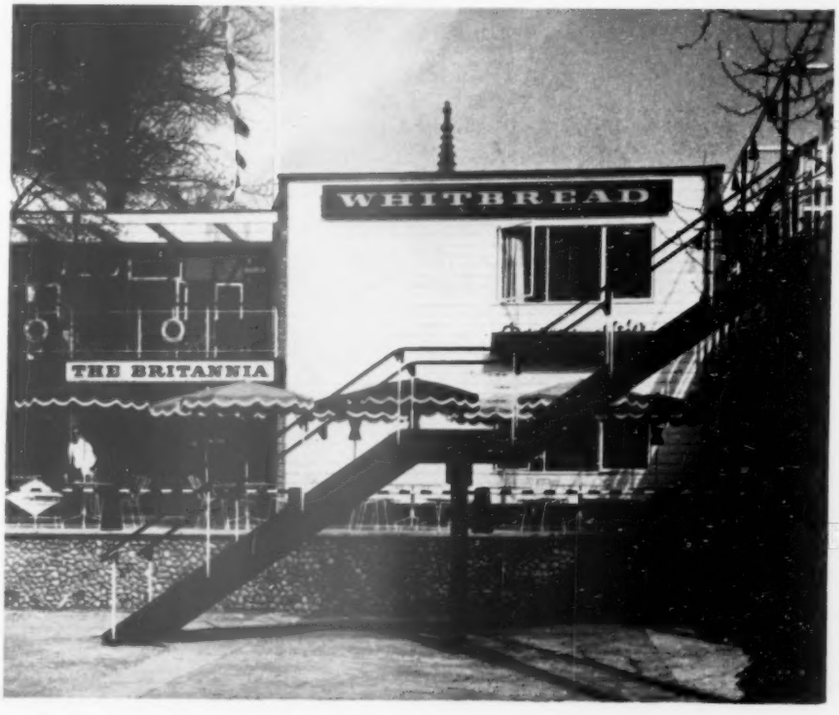
Left, entrance and interior of Hall of Tradition (the foreground pool belongs to Switzerland). Below, in the tree-planted courtyards (see plan on facing page), devoted to cultural and similar aspects of British life. Bottom picture, the Britannia Inn.

of the terrace is a second Turkish pavilion, with a wooden sun-screen covering the upper portion, like a modern version of the traditional *mush-rabbiyah*, containing a restaurant.

Across the road from Turkey, but with its main entrance a short way down the hill, is Great Britain, which is of minor interest architecturally. It consists of a number of separate units, planned in sequence, the first being a Hall of Tradition exhibiting costumes, regalia, etc. It is roofed by a trio of spires which are not large enough to make a dramatic piece of architectural scenery, and do not exploit their light plywood construction well enough to establish an interesting relationship between form and structure. Inside, the darkness and solemnity of style emphasize a reverential presentation of old ceremonies and traditions that no other country has attempted.

Next is a series of lower-ceilinged halls containing scientific exhibits, well contrived but somewhat underlit, and from here the visitor finds his way among clumps of beech-trees through a number of courtyards formed of whitewashed brick walls and with glimpses across a pool of water alongside. These are devoted to inventions and discoveries and various aspects of British life. There is considerable taste and ingenuity in these displays, but much whimsicality and an emphasis on the 'amusing' and odd which is more suitable for home consumption than for export.

Emerging from this open-air exhibit, the visitor crosses a pool and finds himself in a larger tree-planted courtyard with the Britannia pub on his left (a good contemporary exercise in the less fanciful pub vernacular) and the British Industry pavilion opposite. This is a large, fully glazed rectangular building with a tubular steel roof divided into six compartments and a neatly detailed curtain wall. It is crowded with stands put up by industrial and commercial firms (see comments on page 85). Alongside it are kiosks for



8. Gt. Britain
Entrance front of industrial pavilion (night view) and the confusion of stands inside.

the sale of goods and, forming an annexe at the far end, are a cinema, another pub and a rather tastelessly furnished pavilion belonging to the City of London.

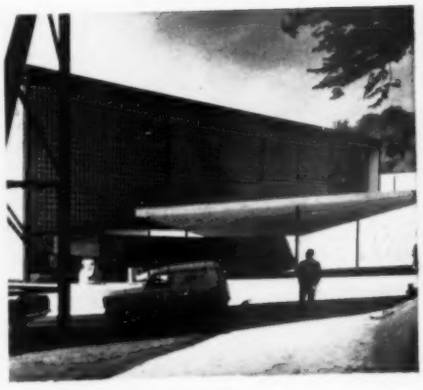
Emerging from the back of the British Industry pavilion the visitor strikes the road again as it curves away to the east. Rather obscurely placed on the other side of it are three Latin American pavilions. The first he comes to, Venezuela, is sunk below the level of the road and approached by a bridge across a forecourt. It has a confused exterior crowned by the segmented concrete roof of the main hall, which is placed at an angle. The hall has clerestory lighting and contains an unusually well thought-out exposition of the character and economy of the country.

Mexico hides behind a screen of cedar slats terminated by a large pictorial mosaic of the kind Mexican architecture has favoured for twenty years. Inside is a hall with an open steel roof. The best things in a somewhat overcrowded display are the pre-Columbian sculpture and the naively macabre folk-art.

The last of this row of pavilions is Brazil, a building whose site makes it difficult to see outside, but one of considerable structural interest with a spectacular interior. The roof (see page 134) curves sharply upwards towards either end, and is structurally independent of the walls. It is slung between triangular steel corner-stanchions and is of lattice-steel and concrete supported on high-tension cables. Inside is one large hall, mostly occupied by an elliptical ramp, descending from the entrance level and curving round a tropical garden. As in the British pavilion, visitors are expected to follow a one-way circulation. Above the tropical garden is a circular aperture open to the sky. This can be closed-in when the weather demands it by an unusual and entertaining device: a balloon, slightly larger in diameter than the aperture, is tethered above it and can be hauled down to fit into it like a stopper into a bottle.

Beyond Brazil the road rises and therefore passes above the West German pavilion, which can be reached from this side by means of a narrow bridge leading on to its upper deck. The

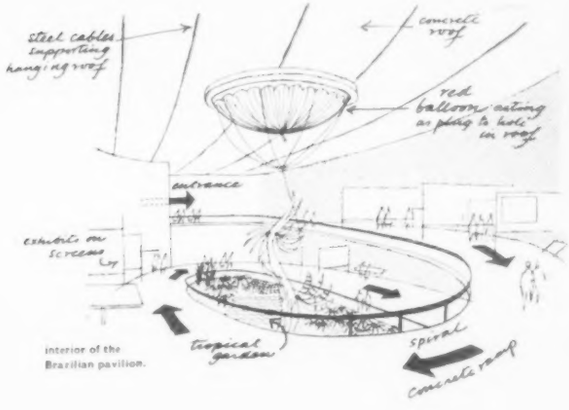
9. Venezuela
From the approach, showing footbridge over sunken forecourt. The stone wall at left belongs to Mexico.



10. Mexico
Entrance front (above left) with cedar grille, and garden court (above right) displaying sculpture.

11. Brazil
From the lawns on the east side, showing the hanging roof.

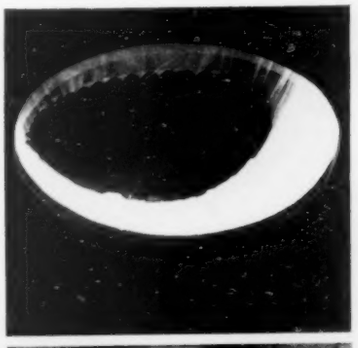
most sophisticated work of architecture in the exhibition, in the form of eight pavilions connected by bridges at different levels with lawns between, this German pavilion is wholly prefabricated and has been designed for re-erection as a school when the exhibition is over. Its notable qualities are the precise elegance of its steel-framed structure, the aptness and thoroughness with which every detail, and every juxta-



interior of the Brazilian pavilion.

11. Brazil

Left, the entrance (right of picture), showing hanging roof, forming a canopy, supported on triangular stanchion. Below, interior with ramp descending round tropical garden. In the large picture the circular aperture is open; in the smaller it is partly and fully closed by its balloon.



position of materials, has been worked out and the poetic effect of its transparency, revealing the internal geometry to the external eye. The interior displays—mostly scientific and industrial—are competently done in a style sympathetic to the architecture, but to the untutored eye may appear somewhat arid and unforthcoming. The building is more fully illustrated on pages 100–104.

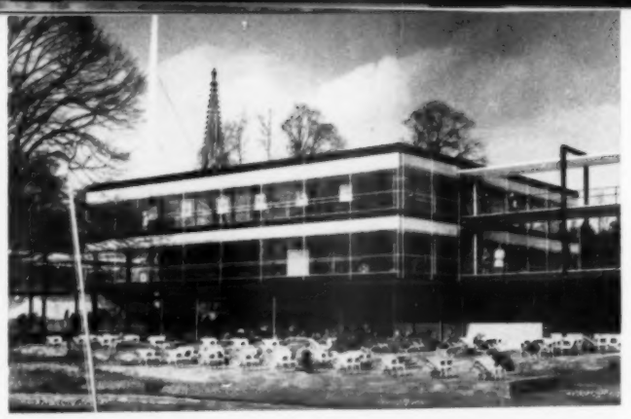
Alongside Germany is Portugal, which shares with Yugoslavia the most charmingly landscaped part of this park-like corner of the grounds, com-

Open-air cafe near the Portuguese pavilion.

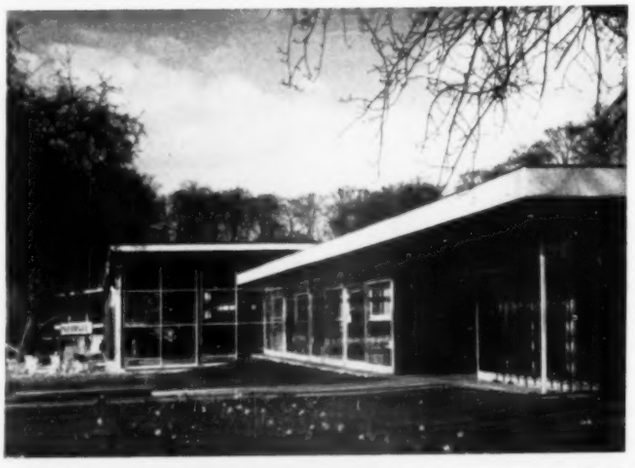
prising lawns bordered by beech-trees, flowing to the edge of a steep ravine The Portuguese pavilion is a competent if uninspired example of the predominant glass cage, with a ceramic *brise-soleil* along the south front. It is another with a ramped one-way circulation, which brings the visitor back to the entrance, of which there is only one. Adjoining the main pavilion is a smaller one of similar character containing a restaurant. Close by, among the trees, is a charmingly informal open-air café with screens and awnings of coloured sail-cloth.

The Yugoslav pavilion makes an even more imaginative use of its pastoral setting, and also has a separate restaurant on the far side of the roadway, charmingly sited across the ravine with the stream flowing underneath it. This and the main pavilion (more fully illustrated on pages 116–118) have much of the sophistication of the German pavilion with an equally interesting use of levels, but without the latter's poetic simplicity, some of the roof-shapes being overelaborate. The Yugoslav interior, though spatially effective, is even more arid than the German, some galleries containing nothing but a few enlarged photographs.

Switzerland occupies the remaining site in this well landscaped corner of the foreign section. It is somewhat chilly in character at first sight, but has many good qualities that emerge on acquaintance, notably the carefully studied relationship between the changing facets of the building and the surrounding trees and the way the forested landscape is framed in the open ends of the



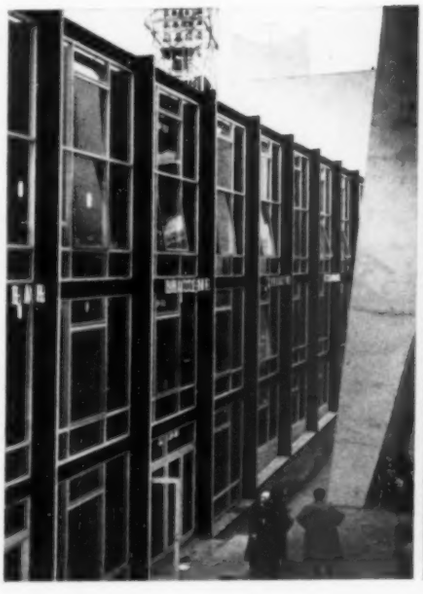
12. W. Germany
From the west (the side facing Gt. Britain). The distant gothic spire belongs to the Leopold I monument on the hill.



13. Portugal
Looking towards the main exhibition building, with Porto restaurant on right.

14. Yugoslavia
First-floor gallery overhanging entrance terrace.

15. Switzerland
From west, showing entrance bridge across pool.



17. The Vatican
Right, steel-framed restaurant. Far right, church with hanging roof. On right of picture is a corner of one of the ski-lift terminal stations.

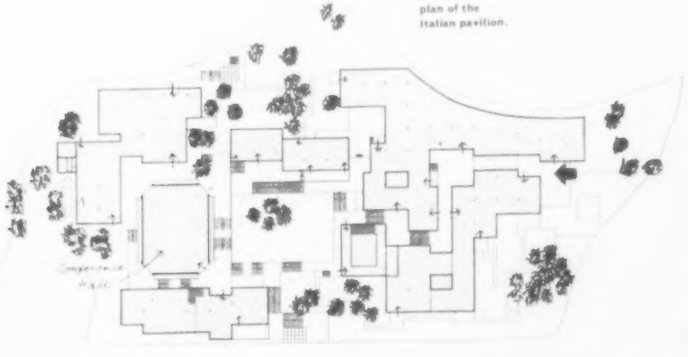
covered galleries. The pavilion (which again is more fully illustrated later—see pages 104–106) consists of a chain of hexagonal halls with a geometrically effective triangular roof-structure surrounding a pool. They are sheathed in aluminium. The detailing and the interior displays are well designed in the puritanical Swiss style. Semi-open-air displays, mostly with an industrial theme, step up the ravine on the far side of a boarded, tree-shaded walk. Both the Swiss and the Yugoslav pavilions look well lit up after dark.

On the way to the next group of pavilions the visitor passes Siam perched on a little hillock. Though a mere period reconstruction, of the kind sophisticated countries nowadays eschew (it is a miniature version of a traditional Siamese temple, in teak, much gilded), it is fresh and gay, sits well in the landscape and furnishes an entertaining contrast to the prevailing mechanistic styles—it exemplifies the same approach as the British Hall of Tradition, but has a lighter touch.

Immediately ahead is the large triangular site occupied by the Vatican. This is the first time the Holy See has been represented at an international exhibition. Of an ambitious group of four buildings (church, conference-hall, exhibition-hall and restaurant) three use the old exhibition technique of timber framing covered with expanded metal and sprayed with plaster. The resulting structures, ungainly in shape and coarse in detail, are of little architectural account, but the church, fan-shaped in plan, has an interesting hanging roof (see page 134) and an agreeably furnished interior, and the exhibition hall a notable collection of art treasures. The three-storey restaurant has a quite different and a fresher character, being of steel and glass with the exposed steel frame painted black and white.

18. Italy

Above, four typical views of spaces enclosed by the buildings. Right, inside the conference hall. Foot of page, conference hall building (with angle windows) and stairs down from hall.



plan of the Italian pavilion.

Beyond the Vatican is Italy—one of the puzzles of the exhibition. It is the work of some of the best Italian architects but completely turns its back on the style of architecture, derived from modern technology, to which they have made such a notable contribution. Perhaps it should be regarded as a declaration of independence of glass-box fashions in architecture, and a re-assertion of the significance of the outdoor, as well as the indoor, spaces that it is architecture's

traditional role to define. The steep hillside site is covered by a sequence of smallish rectangular compartments separated by courts and alleyways, paved with red brick and linked by flights of steps. As an exercise in townscape this has many charms, but the simple form of the buildings, which are of solid brick construction, plastered white, is confused by the vaguely reminiscent profiles given to their parapets, to which is applied a broad blue band. This band is also taken round the doors and occasional windows, which are filled with a single sheet of plate glass, but it is not clear enough what architectural element it is meant to emphasize, and it has the result of coarsening the forms it outlines. The top-most compartment, which alone is two storeys high, has its corners cut off and filled with tall windows, giving it a rather ungainly silhouette.

The upper floor of this compartment is occupied by one bare brick-paved hall with a great chandelier hanging from the ceiling – a most impressive interior made the more so by the way the staircases dive dramatically downwards without parapets or handrails. The other interiors, which are given consistency by their timber ceilings, have a pleasant scale and workmanlike character and are full of interesting detail.

Still further up the hill, in the eastern corner of the grounds, are four little pavilions of no great interest: the Philippines, Cambodia, Ecuador and the Dominican Republic. Below them is one of the most successful, and certainly the most consistent, of all: Japan. This pavilion (the last of those chosen for fuller illustration—see pages 109-110) is timber framed with a spreading butterfly roof, and displays that subtle sense of space typical of the best Japanese architecture, traditional and modern; also a typically spontaneous use of natural materials like timber and stone. It is beautifully integrated with its garden, which is, indeed, an essential part of the exhibit. Established Belgian trees have somehow been made to take on a Japanese aspect.

Close to Japan, and almost hiding it from the main line of approach, is the clumsy and garish pavilion of Iran, which is illustrated here to represent those pavilions (which include Tunisia, Morocco, and other eastern countries) that employ the old fanciful-reminiscent style made familiar at Wembley and elsewhere. Passing beside it the visitor finds himself by the *Porte des Nations* and at the head of the broad avenue that will lead him back to his starting-point by way of the three largest foreign pavilions.

The first of these, on the right, is the U.S.A., an enormous circular building alongside which is a smaller circular cinema. The main building is most effective as a spectacle at night, when the illuminated interior defines the scale and archi-

18. Italy
Typical pavilion interior, with screens hung by iron straps from timber-raftered ceiling.

23. Japan
From entrance pathway, showing timber screen walls and concrete roof-support.

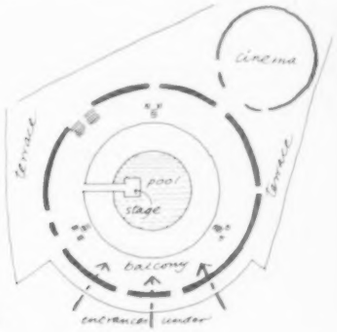
24. Iran
Forecourt and portico. The columns are red and gold.

25. U.S.A.
Looking across forecourt with oval pool containing Calder mobile.

25. U.S.A.

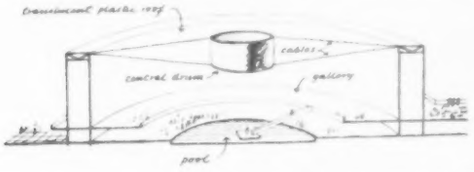
Right, photographic displays viewed from pool edge and balcony. Below, concrete platform floating over pool.

tectural character of the roof-structure. It consists of a drum of steel trellis, filled with transparent plastic and surrounded by gilded columns, which give it a formal neo-classical air. A projecting balcony widens into terraces where it meets higher ground at the sides and back of the building, and these provide the visitor with welcome sitting-space—in most other pavilions he



plan of the U.S.A. pavilion. below, structural diagram.

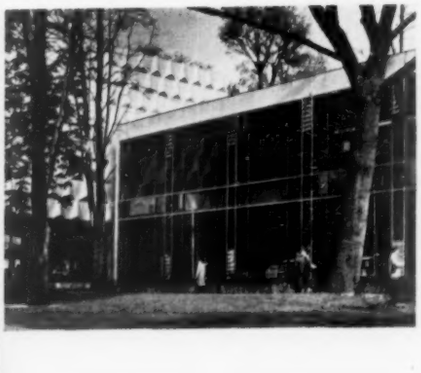
can only sit down in the café terraces, restaurants and bars. The roof (see cover and page 134) is ingenious: a steel drum in the centre is connected to a steel rim round the top of the walls by two layers of cables; steel mesh is draped from the top layer, enclosing the bottom, producing a translucent ceiling with a deeply corrugated surface,



and across the top are laid plastic panels. Inside the central drum the building is open to the sky; rain is caught in a circular pool.

The displays, largely photographic, surrounding this pool, are seen from ground level and from a circular balcony. The whole interior is airy and spacious and invites a freedom of movement that contrasts refreshingly with the claustrophobic, compulsory one-way circulation in some pavilions. The theme of the displays (which include some brilliant satirical murals by Saul Steinberg) is domestic and light-hearted. A mannequin show takes place on a concrete platform suspended over the pool, and there are a working drug-store and day-nursery; also a serious exhibition of modern art such as few other pavilions have, surprisingly, thought worth giving space to. The cinema, and a smaller circular building behind, housing a 'Circarama,' are faced with a patterned ceramic grille.

Just beyond the U.S.A.—and sandwiched rather significantly between it and Russia—are several small and not very interesting pavilions belonging to the Middle East countries. Behind them is the larger Hungarian pavilion in a somewhat modernistic idiom, with its main two-storey block strikingly clad in aluminium. It is well laid



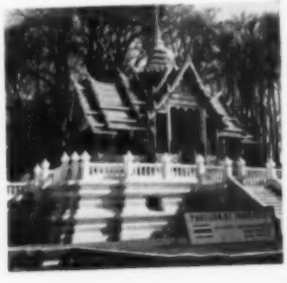
29. Hungary

Left, corner of main building with aluminium wall facing. Beyond (left of picture) is Russia. Above, garden court showing glass-walled industrial gallery.

out inside, especially the industrial exhibits, but the most interesting architectural feature of the interior is an upper-floor art-gallery with unusual clerestory lighting.

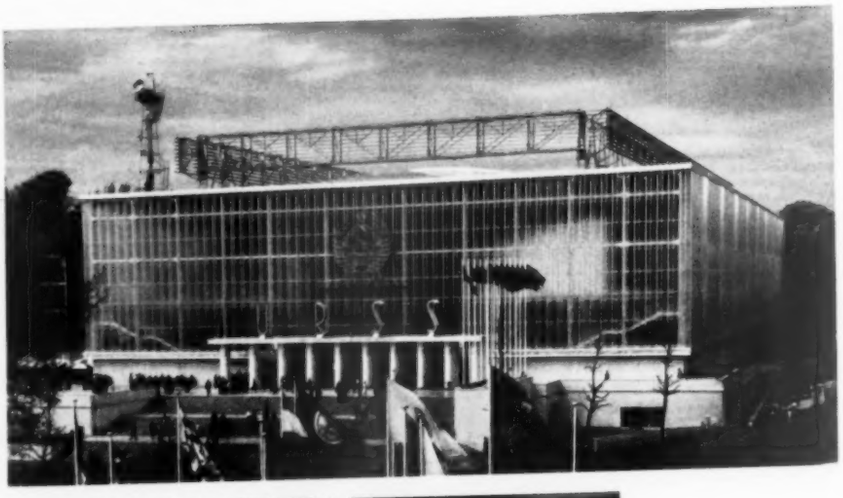
Returning to the large forecourt, filled with apple-trees surrounding an oval pool, on to which the United States faces, the visitor finds himself at the foot of the steps leading up to Russia. These are flanked by a separate Russian building containing a cinema. The main Russian pavilion is large and rectangular and, like the German, has been designed for re-erection after the exhibition is over. Although fully glazed, it manages by the use of obscured glass and close subdivision to obtain an opposite effect to that of lightness and fragility which most architects welcome as the consequence of using curtain-wall construction. The structure of the building is a notable engineering achievement. Two lines of steel lattice stanchions rise through the roof and support hinged trusses which project outwards and slightly upwards. These carry the aluminium framed curtain-wall. Similar trusses projecting inwards carry a central lantern. The trusses are held in position by cables from the top of the stanchion. The lantern is formed of more lattice trusses inclined towards one another and glazed to form a ridge-and-furrow pattern down the length of the pavilion.

There is little sympathy of feeling, however, between this impressive engineering and the architectural embellishments. The lattice stanchions are cased in characterless marble slabs, the foot of the curtain wall terminates in a coarsely moulded decorative aluminium band and in front of the entrance stands a monumental portico with dumpy stone columns. The powerful industrial exhibits inside are of the greatest interest, but the pavilion is overloaded with embellishments in the familiar, unchanging Russian style: heroic bronze statues, naturalistic murals of extraordinary banality and statistics by the square yard set out in raised white lettering on marble panels.

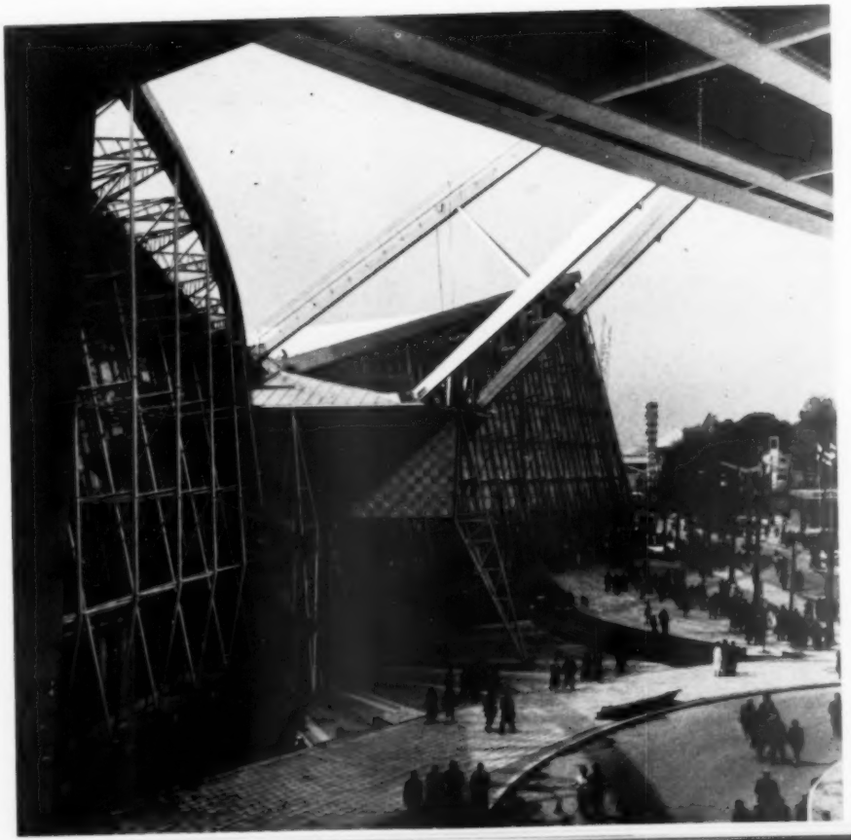


16. Siam
Gilded temple on a podium (see page 93).

West of the Russian pavilion the main avenue passes beneath the *passerelle*, beyond which, on the left, is France, the third of the major pavilions from the point of view of size. This is an enor-

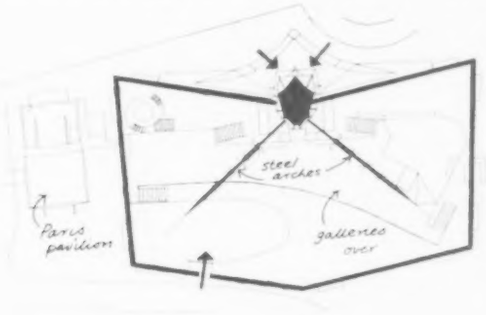


30. Russia
Above, main front with exposed roof-structure. Left, interior with industrial exhibits, showing ridge-and-furrow lantern.



31. France
From the main avenue, where it passes beneath the *passerelle*.

mously ambitious steel structure, which sacrifices almost every architectural consideration to a demonstration of the fact that, with the aid of a counterbalancing arm, most of the weight of a large roof can be taken down to the ground at a single spot. It consists of two twisted rectangles, meeting at a slight angle and with roofs sloping



plan of the French pavilions.

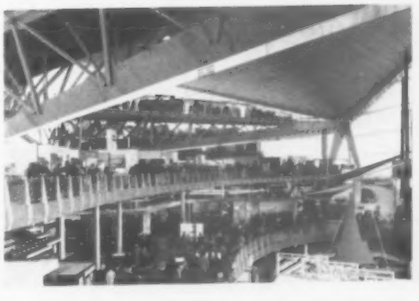
towards one another. The roofs are of steel cable covered with plastic sheeting. These span between edge-beams supported by two steel arches springing diagonally across the two rectangles, balanced by the steel arm that reaches upwards and outwards from the face of the building and also serves as a television mast.

This structural tour-de-force (see also page 136) hardly justifies itself architecturally because the broken-backed shape of the building is ungainly and the high, lattice-steel wall-structure, clad with corrugated plastic, is clumsy and visually confused. The interior, when first entered, gives a breath-taking impression of size, and its upper floor (whose weight is also counterbalanced by the projecting arm) and galleries, reached by escalators, give it additional scale. But the pavilion is so overcrowded with miscellaneous displays as to produce a quite bewildering effect. If the visitor can find his way to them, there are a well-designed art gallery and a sequence of interesting furnished rooms on the lower ground floor. Alongside the main French pavilion is a separate building devoted to the city of Paris, with a roof cantilevered forward from piers at the back and an all-glass front. The proportions are not very happy and the inside is dull.

Across the avenue from it is Argentina, one of the less successful of the glass-box pavilions, with a coarsely shaped curved roof not well related to the type of structure or to the crude shapes of the ancillary buildings (which include a domed cinema) in the foreground. An odd feature of the planning is that the only doorway readily seen from the forecourt is that of the restaurant, the entrance to the exhibition hall itself, which is on an upper level, being out of sight round a corner at the side.

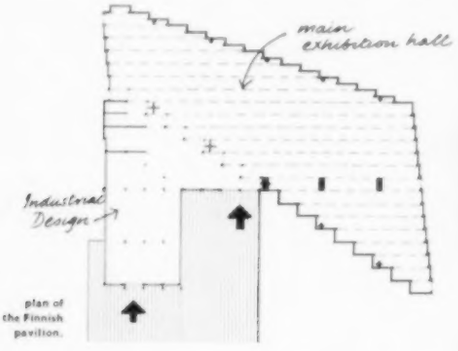
Finland, which is next to Argentina, can always be counted on to produce an interesting demonstration of the architectural possibilities of timber. This pavilion is no exception, though its exterior is not wholly successful from all angles. Set

31. France
Left, detail of external wall (south-west corner). Below, inside the main entrance showing base from which whole steel structure springs. Beneath this, general interior showing multi-level balconies, and exterior of Paris pavilion.



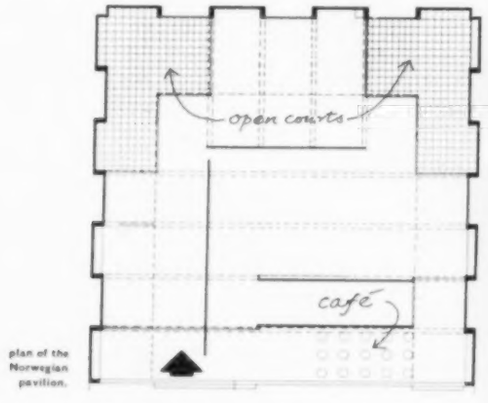
32. Argentina
From main avenue. Entrance is behind screen on right. Domed building on left is cinema. At top of picture is part of one of the ski-lift tubs.

against a steep hillside, it is a building of some geometrical complexity, serrated on plan with a roof serrated in profile, providing continuous clerestory windows at several levels. The interior, however, relies largely on artificial lighting, with



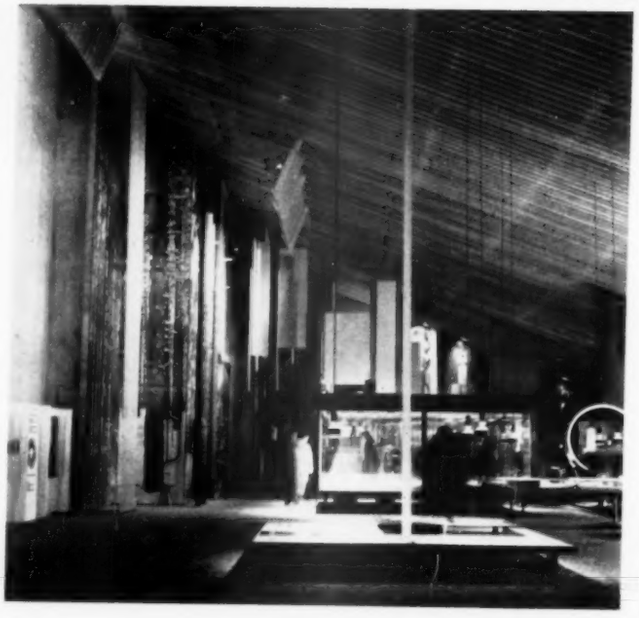
lights concealed behind slatted timber troughs. Steeply sloping ceiling rafters conceal the roof structure and create an interesting interior space: high on one side, where huge photographs are mounted on the wall; low on the other. The detailing is simple and consistent and the interior smells delightfully of newly sawn wood.

Alongside Finland is Norway, a modest pavilion roofed with huge beams of laminated pine with parchment-like plastic stretched between them, lit from above at night. It is a building of subtlety and charm, and comes unexpectedly from a country that has not made much contribution to modern architecture. A good sense of space is achieved in a smallish interior by all display stands being kept low. Across the front is a



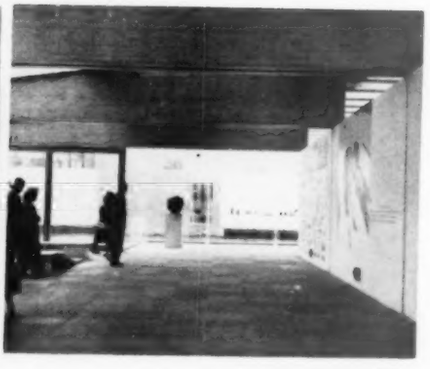
stone-paved terrace sheltered by the overhang of the roof, the front wall being of plate glass and vertical boarding.

Down this side of the avenue the ground rises to form a little hill, on top of which are a couple of rather comical little concrete forts representing Andorra and San Marino. On the opposite side is Austria, the last of this main group of foreign pavilions, since beyond it is The Netherlands (already discussed) where the avenue emerges at the *Porte du Benelux*, the starting-point of this itinerary. The Austrian pavilion is a building of some sophistication, notable for its dignity and



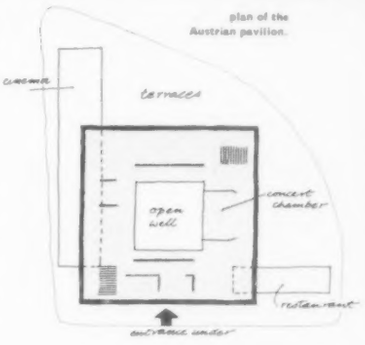
33. Finland
Above, timber-clad exterior, with clerestory roof-lighting. Left, interior, with sloping raftered ceiling and low display tables.

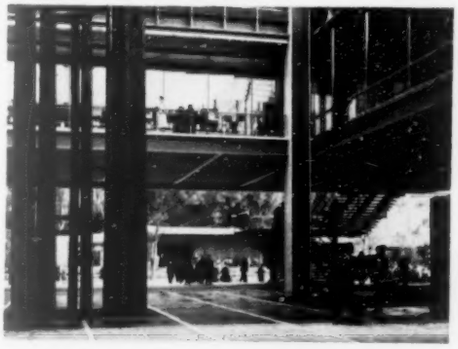
34. Norway
Left, exterior from main avenue. Below, detail of entrance and interior showing built-up timber beams; open courtyard (see plan) at extreme left.



restraint and for the sense of quality apparent in every detail of the design. The exhibition galleries are almost wholly on the first floor, planned round a square paved courtyard. They are supported only on four steel stanchions at the internal corners. The superstructure is welded steel. Inside the exposed frame, which is painted grey, are walls of corrugated glass-fibre sheeting. These are translucent, so that the galleries are well lighted, but not transparent enough to see out. The exhibits are mostly cultural in character, emphasizing Austria's role as a bridge between east and west, and are beautifully designed with a notably successful use of etched copper plates. The visitor can see and hear music-lessons being given in a timber-panelled conservatoire. Austria is the only country that has made its girl attendants part of the design of the building. They are dressed in brilliant yellow which is well set off by the calm greys, whites and blacks of the architecture.

37. Austria
Left, exterior (with one of the ski-lift tubs travelling along its cable). Below, inside the courtyard with supporting corner stanchion at right.

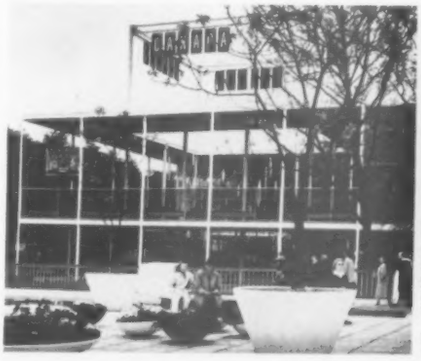


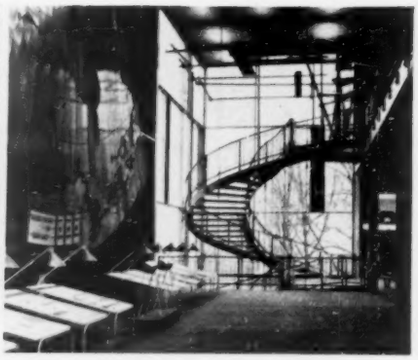


The remaining foreign pavilions are sited in the thickly wooded area between the main avenue in which Austria stands and the Belgian sections of the exhibition. They are reached by a steep pathway from the *rond-point* by the Dutch pavilion, which passes behind San Marino and Andorra. Along the pathway on the left are three small pavilions: Liechtenstein, Nicaragua and Israel, of which only the last holds any interest. This is a narrow glass-walled building on a sloping site. The plan skilfully uses the slope of the ground to bring the visitor through the main hall, down a flight of stairs into an open courtyard and out by a passage beneath the entrance gallery.

39. Israel
Right, entrance gallery with (left of picture) exit from low-level courtyard beneath.

41. Canada
Below, exterior. Below right, looking outwards showing circular steel staircase.



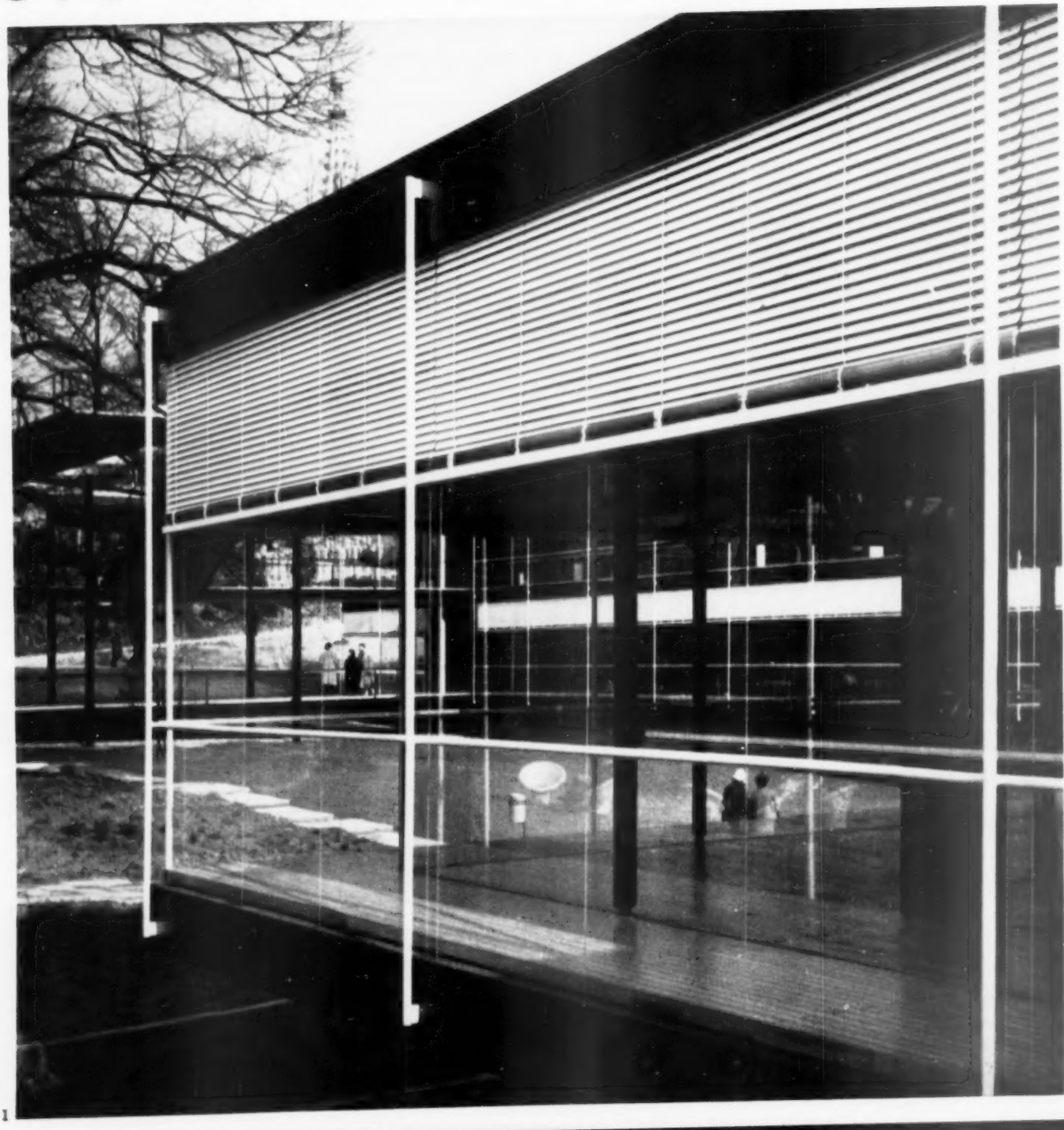


Beyond Israel, on the right, is Canada, a quite ambitious pavilion whose architects can hardly have realized when they designed it that the front, facing towards the centre of the foreign section, was going to be masked by the high blank wall of the Russian cinema. It can only with difficulty be approached from this side and since the adjoining side is below the level of the *passerelle* the pavilion finds itself somewhat cut off from the rest. It is a competent building with an orthodox steel frame, partly glazed and partly open, providing airy wood-decked terraces. These are reached by ingeniously constructed ramps and staircases, supported on steel channels and suspension cables. The exhibits are competently but conventionally displayed.

The last of the foreign pavilions is Czechoslovakia, tucked away among the trees in the northernmost corner of the foreign section, beside the *Porte du Parc*. It is a large affair in a rather self-conscious modern idiom, resembling the Hungarian but more ponderous. The detailing is heavy and there are large expanses of solid mosaic-faced walling. But the planning is good, with two storeys of galleries glazed on the side that faces a garden court. The industrial exhibits are impressive in themselves, but, perhaps owing to lack of variety of scale, the cumulative effect of the interior is one of dullness.

42. Czechoslovakia
Entrance forecourt; industrial sculpture on right.

SIX OUTSTANDING PAVIL



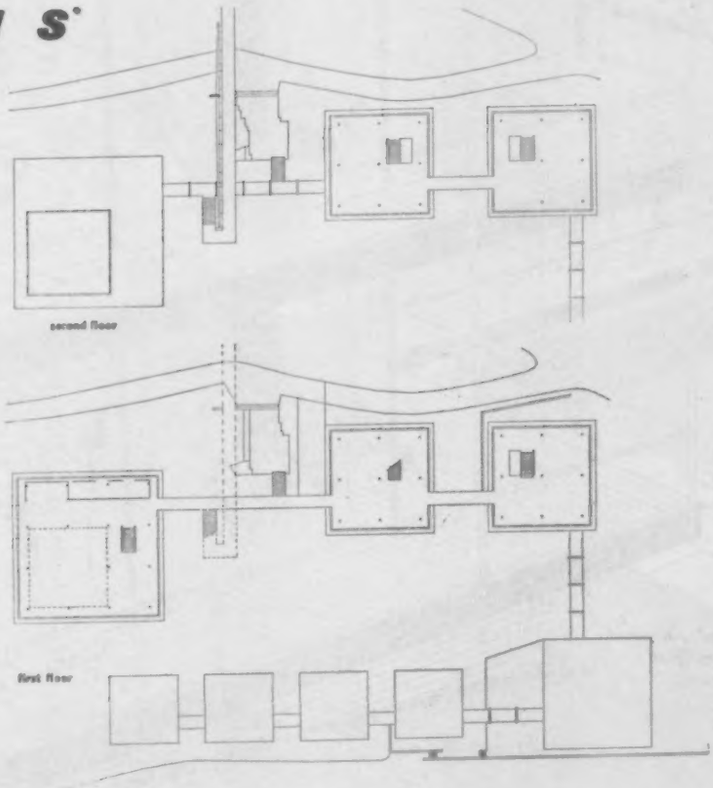
I O N S

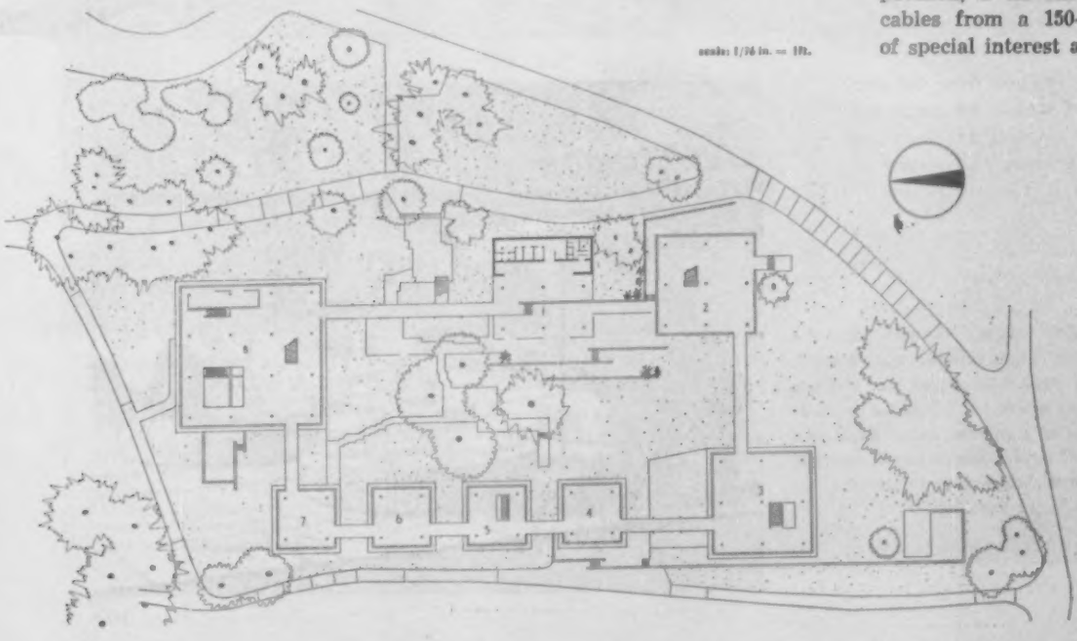
1. W. GERMANY

architects: Egon Eiermann and Sep Ruf

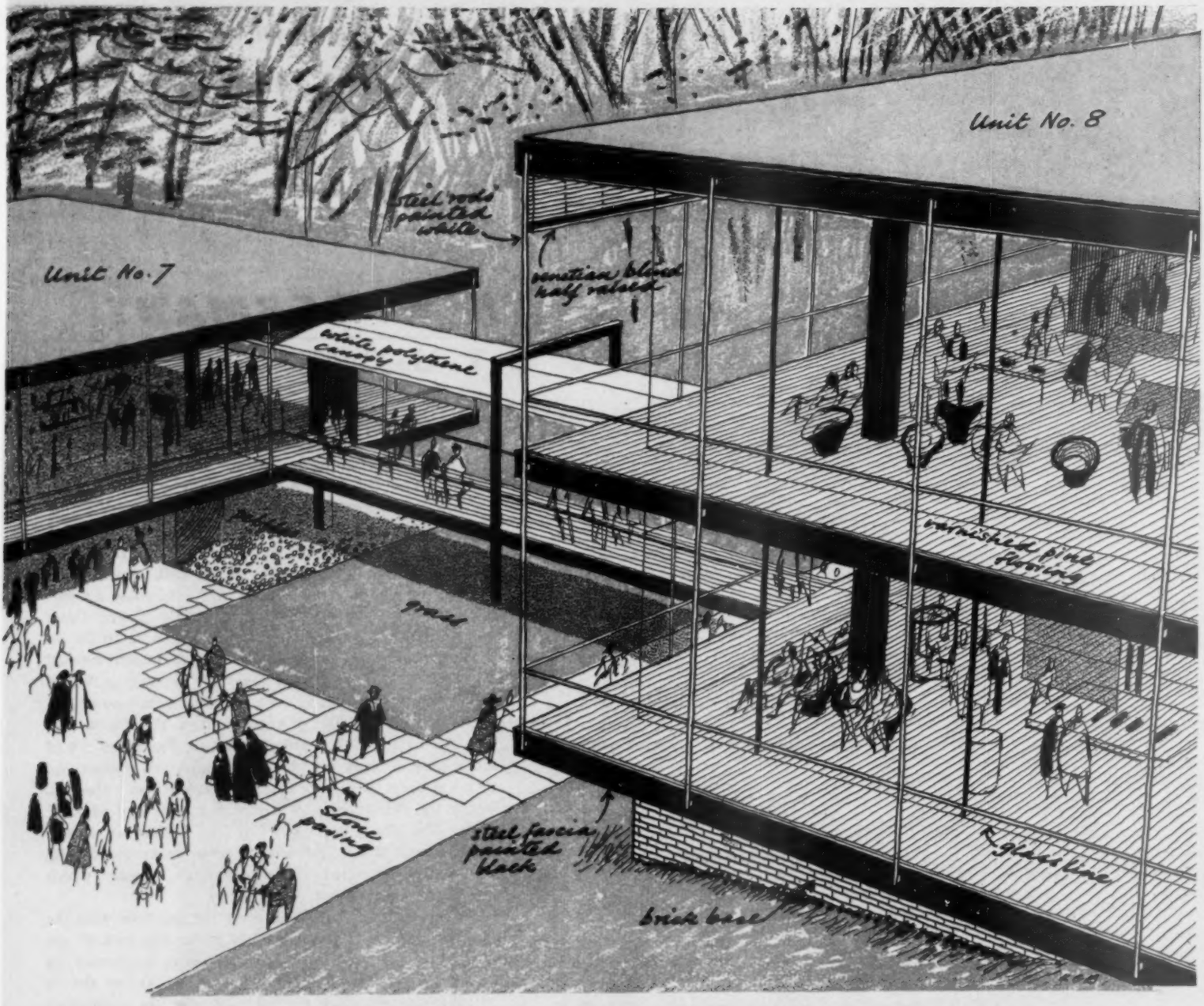
The pavilion consists of a chain of eight fully glazed square buildings, each a self-contained unit but linked by bridges, surrounding and spanning over a tree-planted sloping lawn. The five units on the lower side are two-storeyed ; the three on the upper side are three-storeyed. The construction, completely prefabricated, is of welded steel, each pavilion being supported on 4, 9 or 16 box stanchions. These are set at about 30-ft. centres, the outside stanchions being invariably placed some six feet inside the glazed wall, which is itself placed three feet inside the roof and floor edge to give room for an outside passage-way. The steel fascias which conceal floors and roofs are linked together by steel stiffeners bracketed out an inch or so from the fascia line and to these is welded a line of tubular rails. The fascias are painted black and the stiffeners white. The floors are of white pine decking (which in the connecting bridges and in areas open to the weather is caulked) ; an exception being the industrial pavilion where they are of steel plate. The glass stops short of the ceiling to ensure natural ventilation, and every façade is provided with electrically-controlled white venetian blinds which operate as a single unit.

The entrance bridge, connecting the top floor with the high ground which rises steeply up to the east of the pavilion, is an unusual structure, being suspended by cables from a 150-ft. high steel pylon. Other details of special interest are the canopies over the connecting

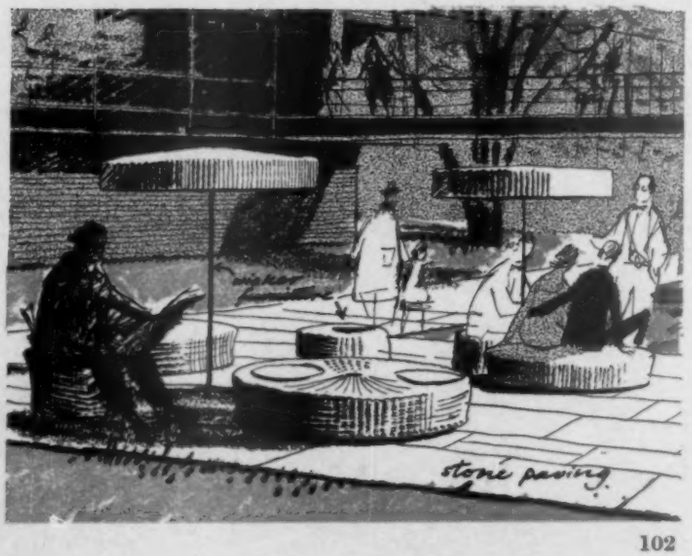




1 (facing page), a corner of one of the eight units of which the West German pavilion is composed, showing the black-painted exposed steel frame, white-painted stiffeners and the glass line set back 3 ft. inside the frame. On the ground-floor plan on the left the contents of the units is as follows : 1, restaurant (enclosed kitchen beside it) ; 2, industry ; 3, housing and town-planning; 4, wine-bar; 5-6, recreation; 7, health and welfare; 8, education. On the first floor of unit 8 is an assembly hall.

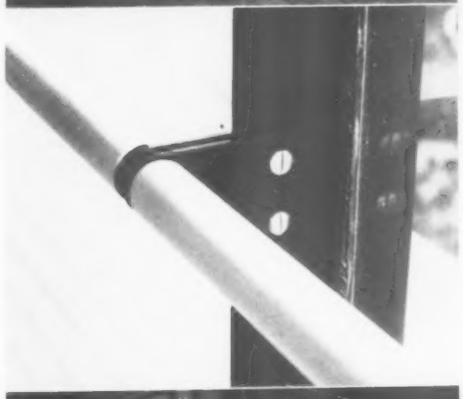


bridges which are of polythene stretched over tubular steel frames, the internal stairs, of which the steps are of solid timber, and the centrally pivoted double doors which face on to the connecting bridges and served to close the separate units at night.



Above, looking outwards from the central court, between units 7 and 8 (see ground-floor plan on previous page) which are connected at floor level by a covered bridge. Right, the paved terrace outside unit 8, equipped with wicker seats and umbrellas (see also facing page).

2



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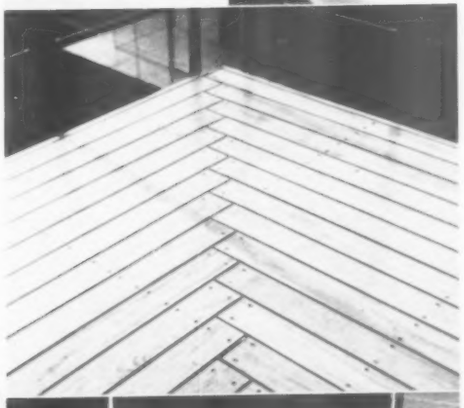

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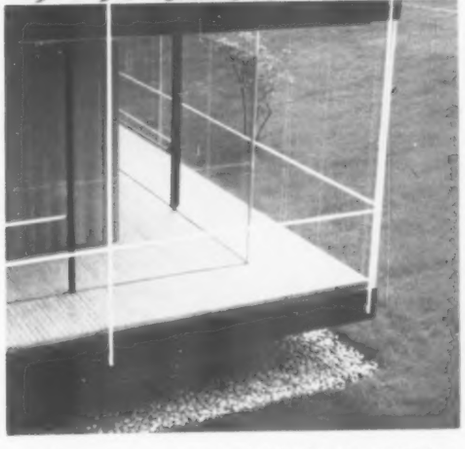


5

The German pavilion is notable for the precision and aptness of its standardized details. Four examples:
2. internal stairs with steps of solid timber and balustrade of steel tube and tensioned wires;
3. the handrail which protects the inside face of the glass wall—a wooden bar, bracketed from either side of the flange of the steel upright;
4. pine floor decking;
5. the same from outside, showing the profile of the base of the building.

6

WEST GERMANY

6. from the south-west. The units shown are nos. 3 and 2 (see plan). The weakly designed sign-post in front is Belgian.
7. the bridge connecting units 1 and 8 with, on the right, the cantilevered staircase leading down from the high-level bridge approach (at top of plan).
8. paved area in front of unit 8, with wicker furniture.

7

8

9

10

WEST GERMANY

9. a typical first floor interior view, showing the open-air passage-way that surrounds each unit outside the glass-line. The handrail seen on the left, just inside the glass, is that of which the fixing is shown in detail on the preceding page.
10. looking from one unit to another along the connecting bridge. The roof of the bridge, which penetrates beneath the ceiling of the building at either end, is of white polythene stretched over tubular steel frames.
11. one of the connecting bridges from outside; also the cantilevered staircase leading down from the high-level entrance. Where the bridge enters the building can be seen one of the centre-pivoted, blue-painted doors (only visible end-on in 10) by which each unit can be closed at night.

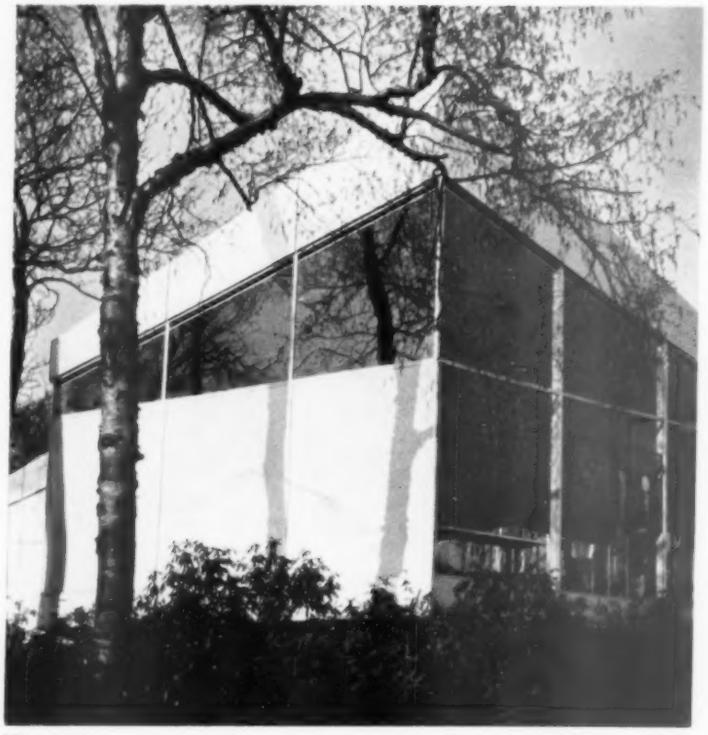
11

2. SWITZERLAND

architect: Werner Gantenbein

The pavilion is composed of large hexagonal units planned round an irregular shaped pool with stone-paved surrounds. Each unit (there are 31 in all, plus one double unit to form an assembly room) is six-sided with a double pitch roof which invariably runs on the north-east-south-west axis, an arrangement which enables contiguous hexagons to obtain clerestory lighting along the planes of the roof verge. The structure consists of tubular columns, placed one inside each external angle, with a seventh column beneath the centre of the floor. The roof of each unit is spanned by lattice timber trusses and clad in aluminium sheet. The external walls are mostly glazed, and where opaque are also clad with sheet aluminium. This same metal is used for the wall framing, for which a set of extrusions was specially designed. These comprise uprights and head and sill members which are substantially of I-section with finned webs to receive clip-in aluminium beads in two alternative positions, according to whether

12. close-up of the corner of the main Swiss pavilion showing the standard hexagonal unit, with double-pitch roof, of which it is composed. The wall sheathing is aluminium.



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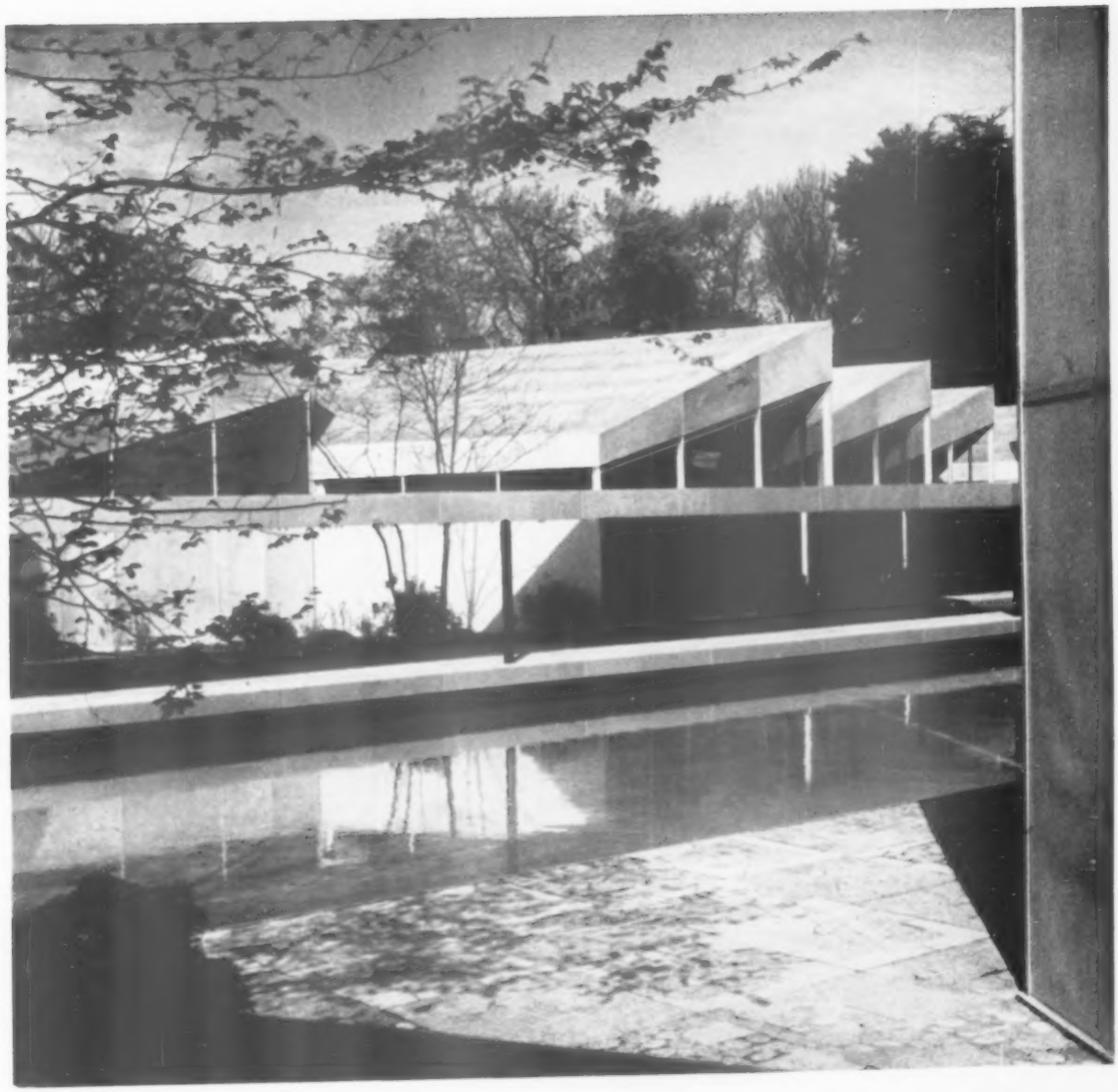
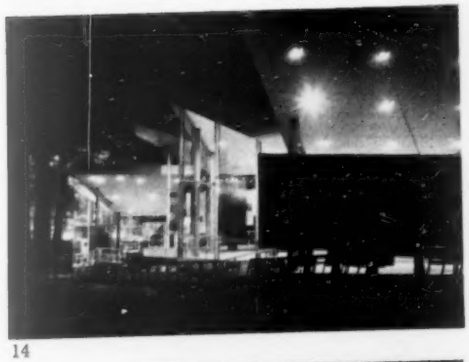


13

13. the aluminium-sheathed galleries seen from across the pool; i.e. from the paved terrace between the tourism and agriculture exhibits (see plan on this page).
14. night view from outside showing ceiling illumination.
15. inside the gallery entitled 'Instruments.' Outside the windows a pathway slopes down towards the French pavilion.

the panel to be received is opaque or glazed. The separate pavilions perched over the ravine on the other side of the boarded pedestrian walk along the north-east side of the main pavilion are similarly constructed.



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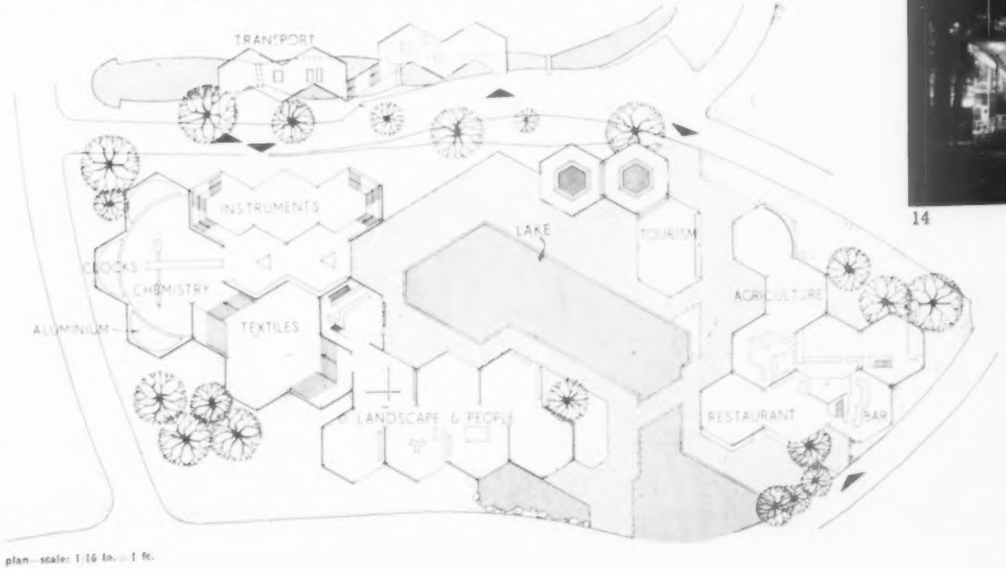
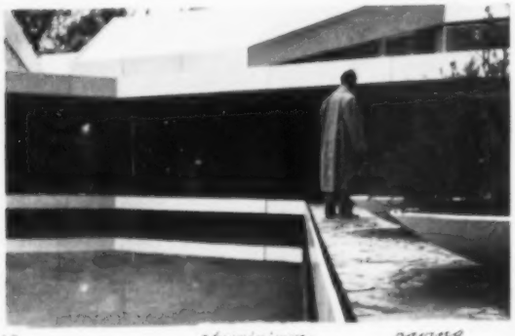


plan—scale: 1/16 in. = 1 ft.

15

SWITZERLAND



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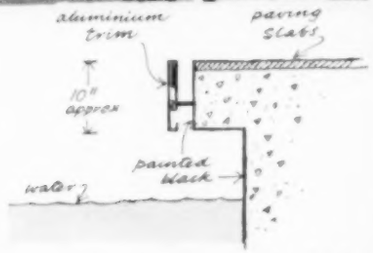
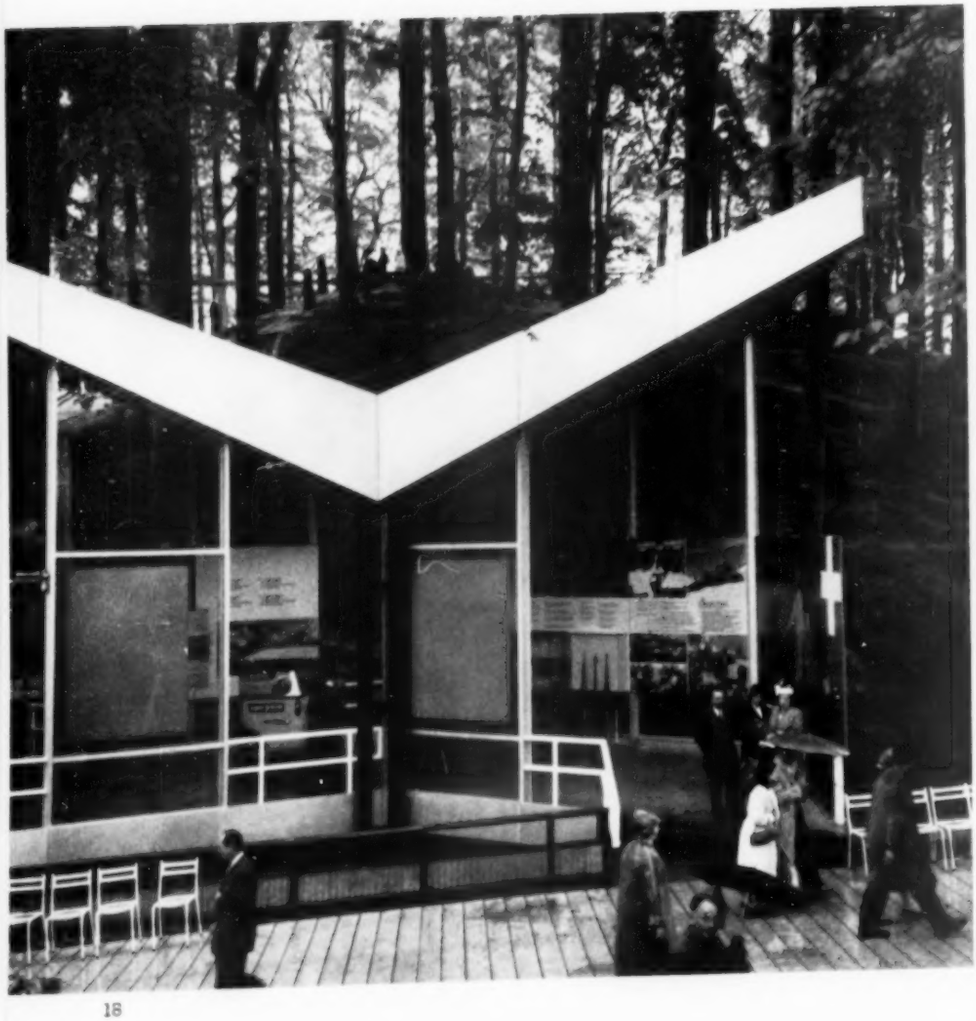
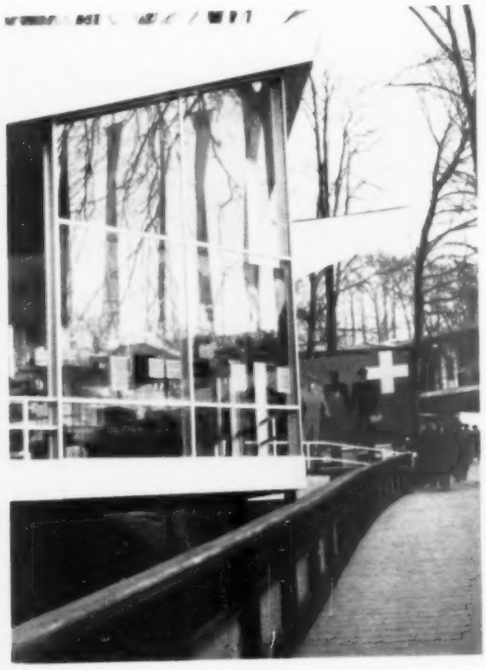


16. edge of central pool showing stone paving finished with aluminium fascia (see sketch).
17. paved terrace with boarded ceiling and forest view framed in the opening beyond.

17

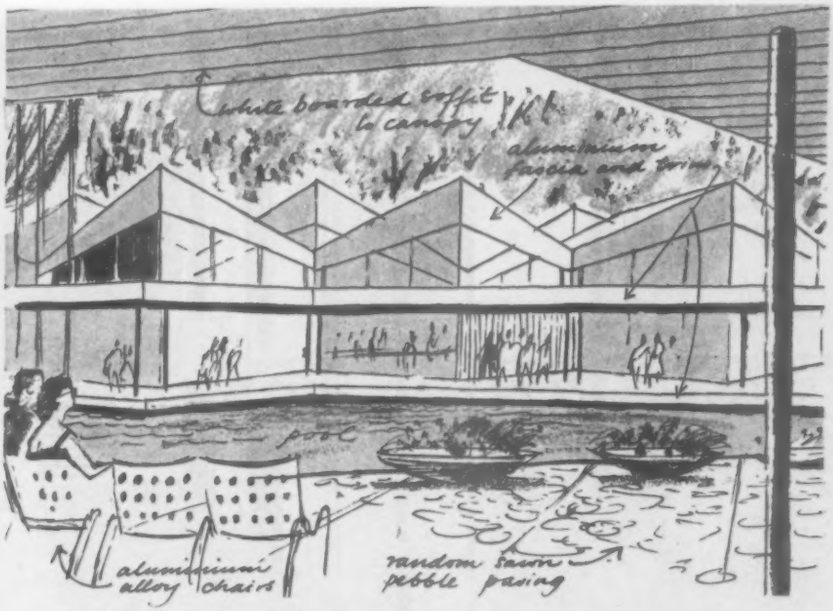


18



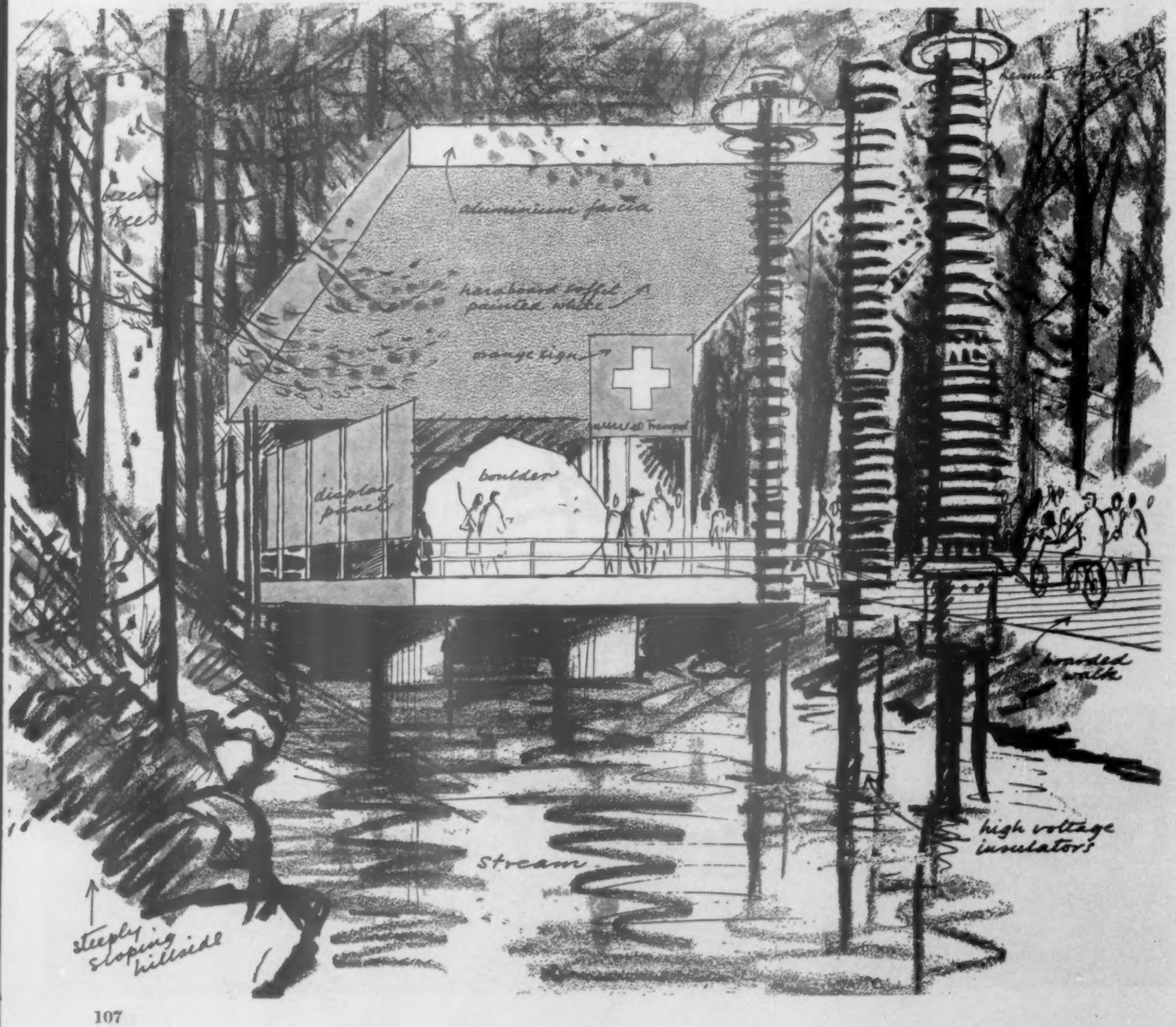
19

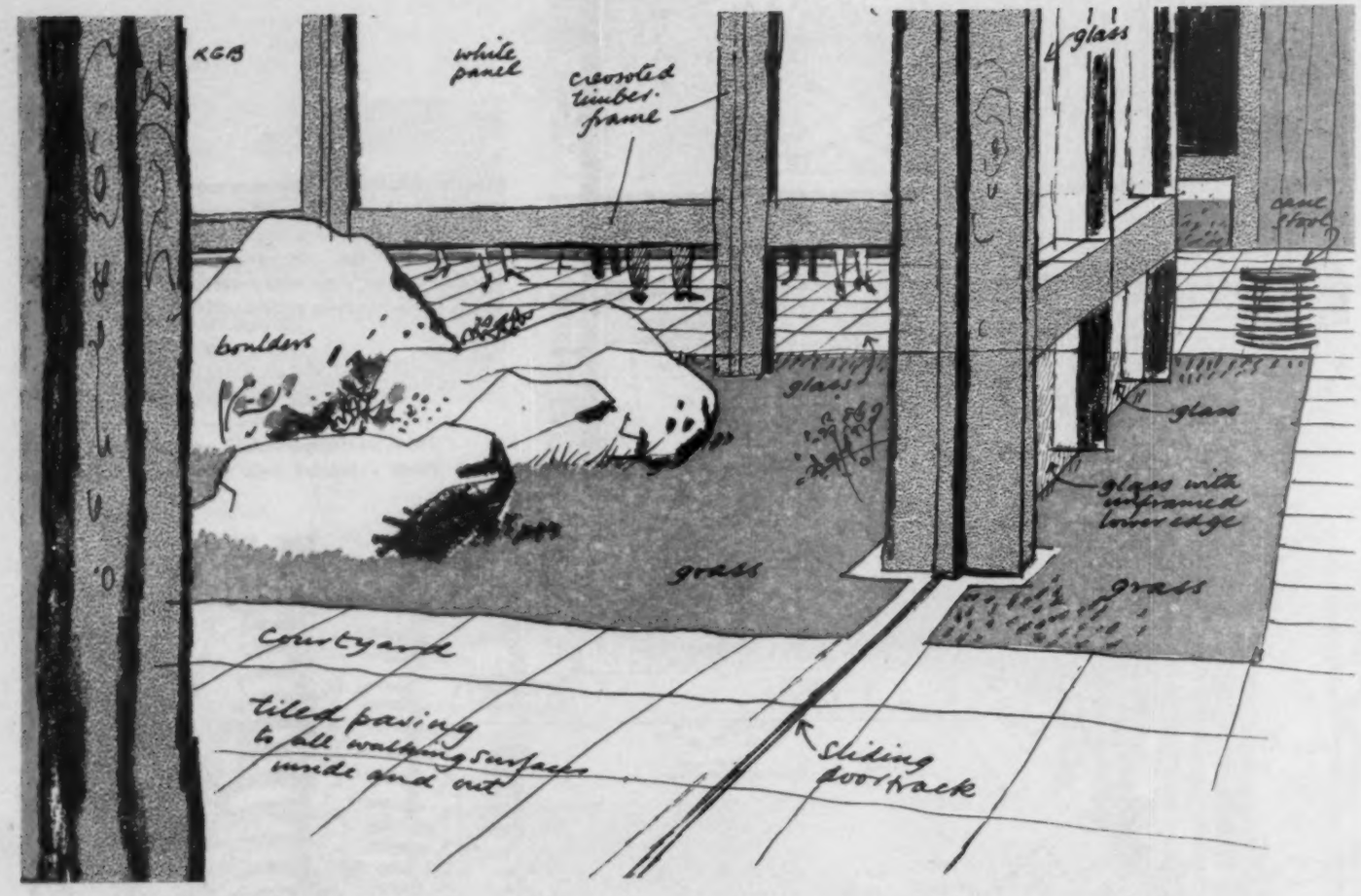
Across a boarded pathway from the main Swiss pavilion is a subsidiary semi-open-air exhibit dealing with transport, based on the same type of aluminium and glass unit, 18. A wooded hill climbs steeply behind, and the galleries are built over a ravine, 19. Their siting is shown also in the lower drawing opposite.

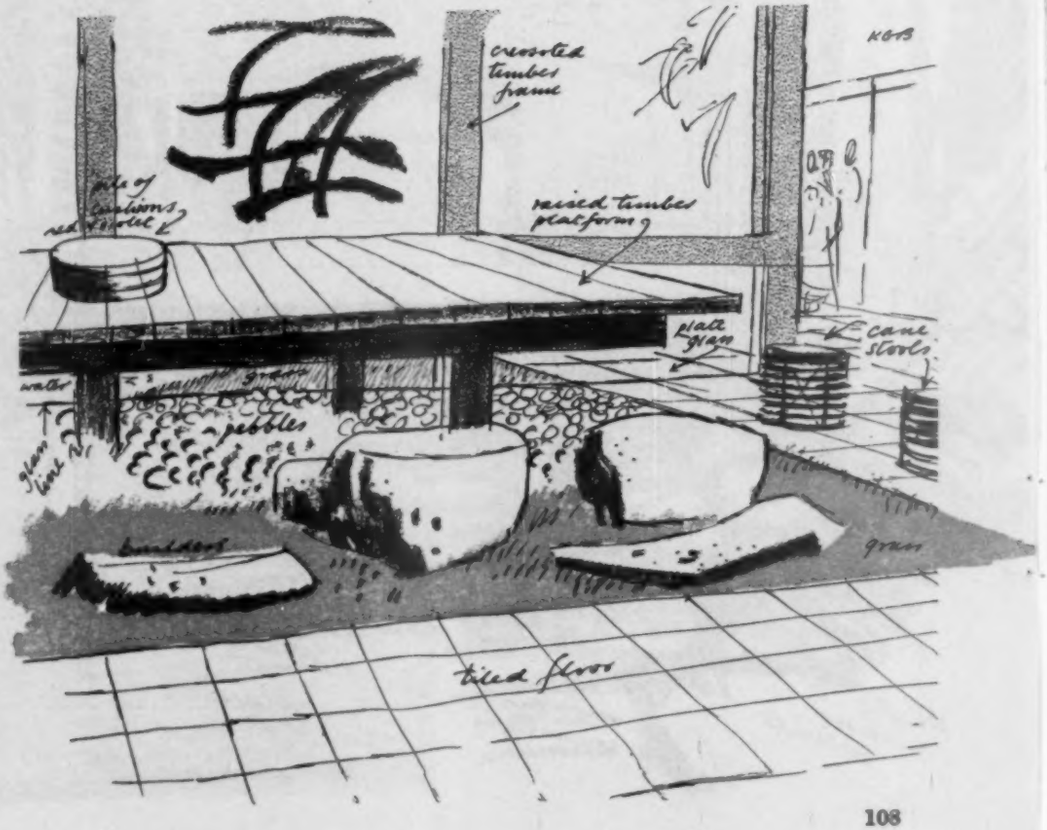


Left, the main Swiss pavilion surrounding its pool from beneath one of the covered terraces. These have boarded ceilings painted white (see also photograph opposite) and are paved with irregularly shaped stones and sawn pebbles.

Below, the transport exhibit, perched above a stream, across a boarded walk from the main pavilion.





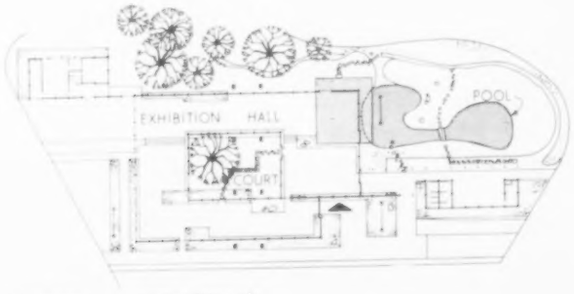


The Japanese pavilion, besides making much of its garden, brings the elements of nature into the building itself. The timber-framed walls, top picture, are open (though glazed) at the bottom, and the grass and stone paving of the courtyard and surrounding terraces flow continuously beneath them. In the exhibition galleries rocks, grass and pebbles, bottom picture, provide a floor-scaped setting for the exhibits which are set out on low wooden platforms.

3. JAPAN

architect: Kunio Mayekawa

The plan is a hollow rectangle with smaller units projecting from the two shorter sides. The main rectangle is covered with a butterfly roof which is open over the central courtyard. The principal support for the roof is four pairs of reinforced concrete 'legs' over which pass two I-section deep steel girders resting on steel pads. Additional support is provided by columns placed at 8-ft. centres round the enclosed area. These columns are made from $1\frac{1}{8}$ in by 3 in. mild steel flats stiffened through the bottom half of their height by timber framing. It was originally intended that the roof should be assembled in large prefabricated units, but in the event it was site fabricated. Lattice girders run down the length of the roof. These are connected laterally by tie beams and stiffened by diagonal tie rods. Since the roof oversails the walls at both ends along the long axis, it is held down at these ends by four pairs of cross wires. The greater part of the walls which enclose the pavilion are of plate glass and the floor has been deliberately contrived so that the traditional Japanese garden floorings—moss, pebbles and white gravel—pass freely inside the enclosing walls. The fascias are of sheet steel, the roofs are sheathed in copper, and the timber is creosoted. The smaller units at either end are of traditional Japanese timber construction, one of them housing the restaurant and the other staff accommodation and an electrical sub-station. The garden, with pool and concrete bridge, also penetrates into the central court. It is reached by crossing the terrace beneath the end of the main roof and passing beneath it, between the main building and the small end unit.



layout plan scale: 1 96 in. = 1 ft.

20

21

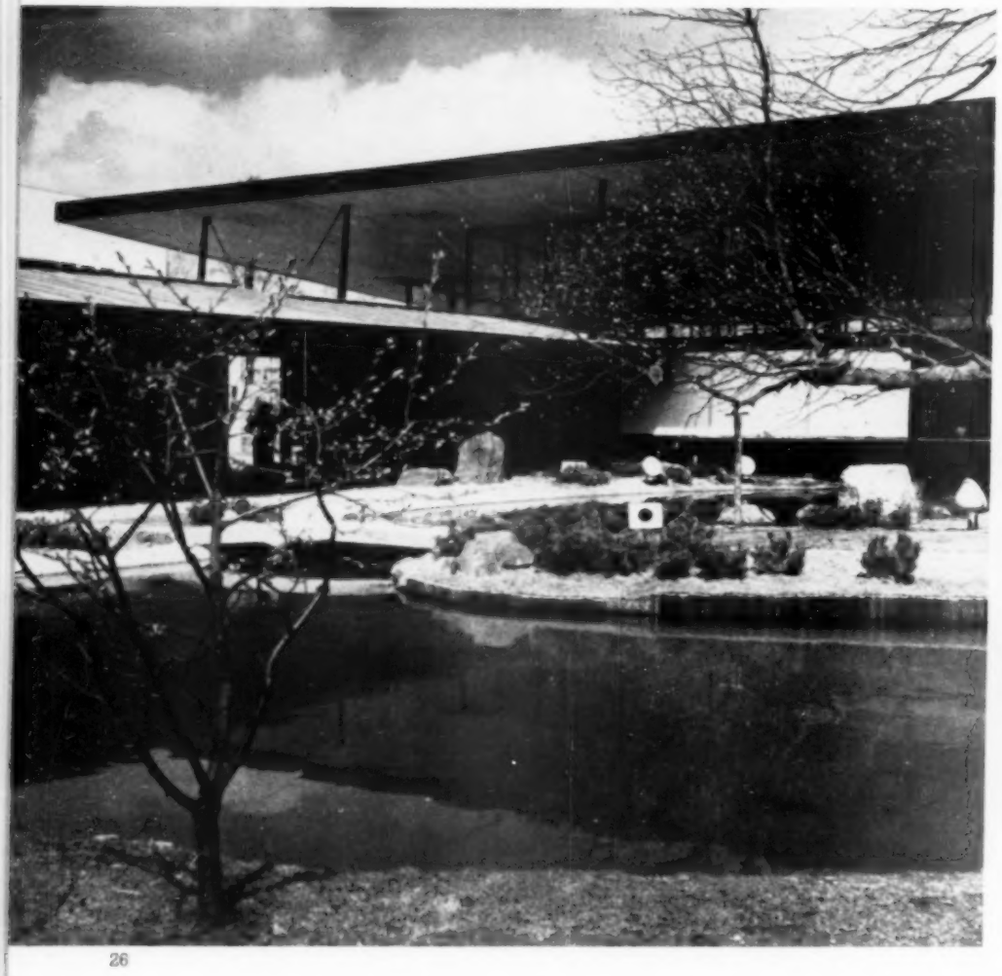
20. exterior from terrace. The way through to the garden is on the right.
21. detail of roof structure: garden side of the pavilion.
Below: 22 and 23. rocks and floor textures in the garden, which penetrates beneath the building;
24. the garden from the covered terrace, with foreground of rocks;
25. rocks are used even inside the exhibition galleries.

22

23

24

25



26

27

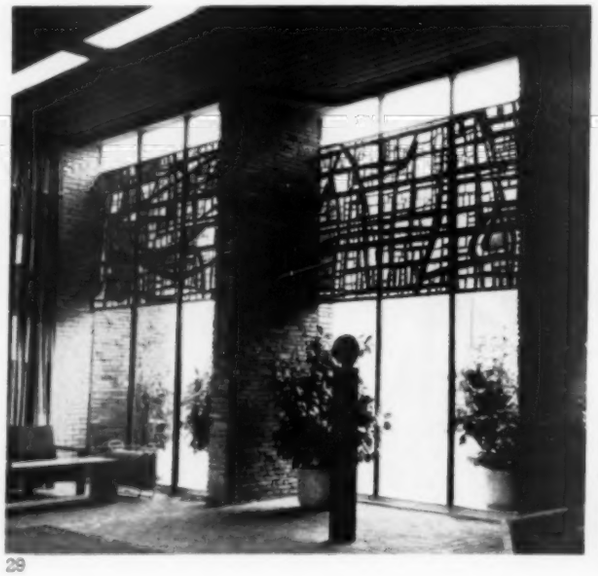
28

26. from across the garden pool. On the left is the café.
27. the oversailing end of the roof, held down by cross wires. Note the continuous clerestory lighting and, in 28, its effect inside a typical exhibition gallery.

4. THE NETHERLANDS

architects: van den Broeck, Bakema, Boks & Rietveld

29. inside the entrance hall: narrow bricks laid with artful unevenness; brick paving, boarded ceiling; panels of stained glass with thick lead cames.
30. exhibition gallery: courtyard side (nos. 6 and 7 in plan on facing page). The clear glass wall is topped by glass louvres for ventilation. The same system of louvres forms an overhang in the open-fronted galleries.

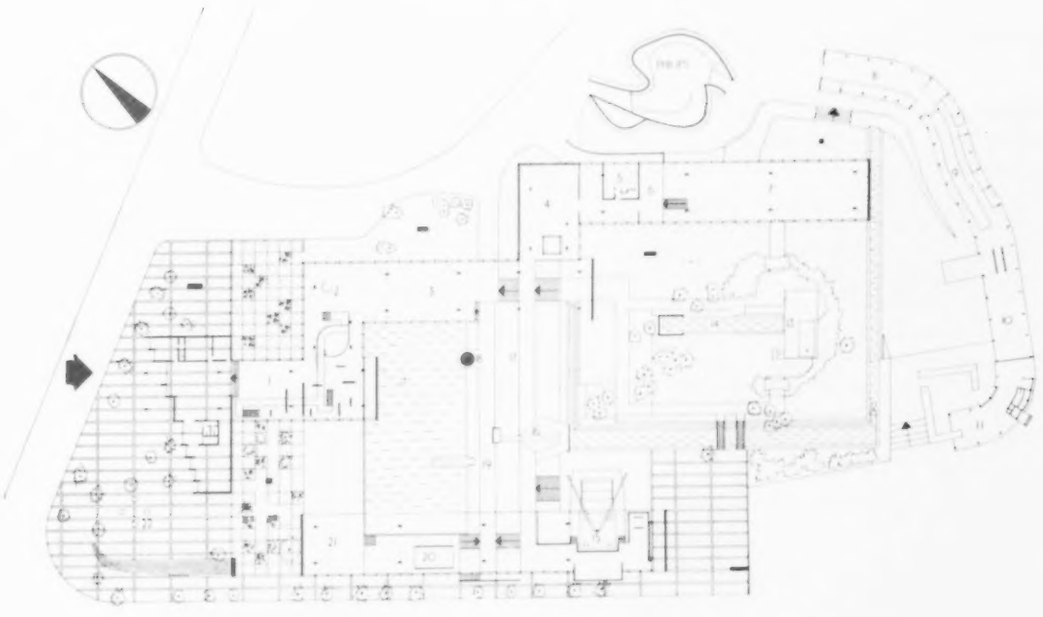


29

30

key

1. pavilion of the Netherlands Kingdom.
2. information centre.
3. metal industry.
4. chemical industry.
5. modern house-furnishing.
6. glass industry.
7. textile industry.
8. pigs and poultry.
9. cattle.
10. agricultural research.
11. cafe-restaurant.
12. watermill.
13. Zuider Zee.
14. wave-channel.
15. shipping.
16. pumping station.
17. dike.
18. lighthouse.
19. pier with beacon.
20. harbour.
21. aviation.
22. carillon.



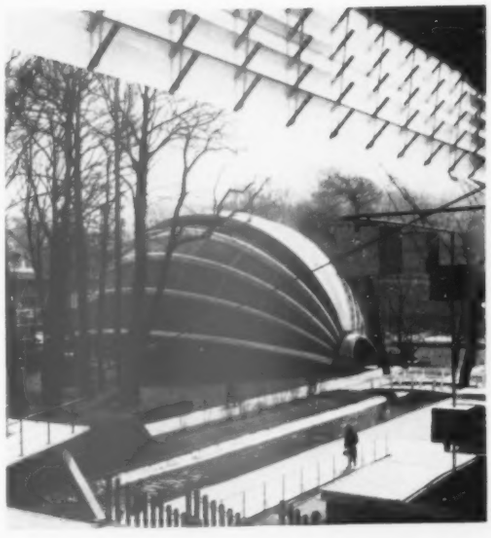
layout plan

Scale: 1 128 in. = 1 ft.

Covered exhibition galleries surround a series of descending terraces, partly paved, partly grassed, with pools of water. These (one of which has artificial waves) are part of the central outdoor exhibit dealing with land-reclamation and similar subjects, and illustrating the system of dykes, canals and polders which determine the character of the Dutch landscape. Although freely planned, so that the visitor is not confined to a one-way circulation, the pavilion is designed to be seen in a definite sequence, starting at the main entrance (arrowed on plan) and continuing clockwise.

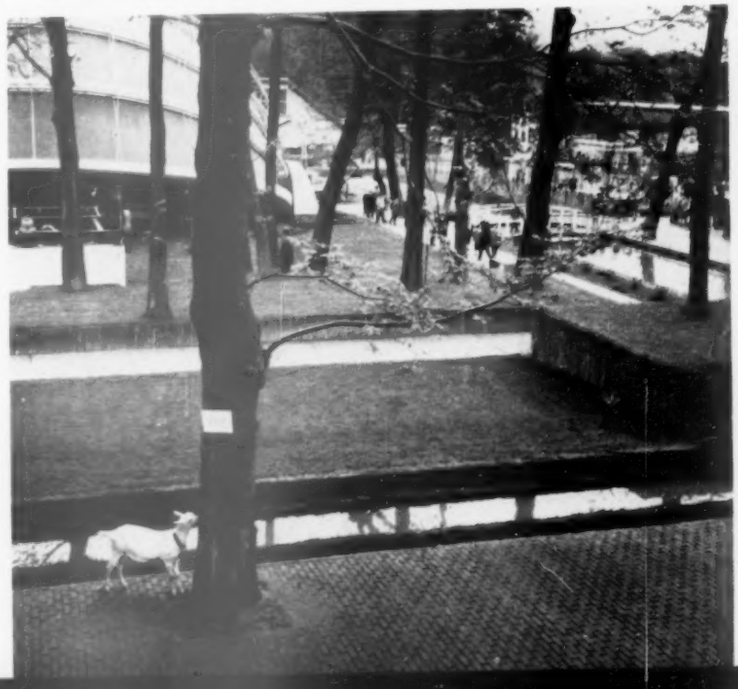
Apart from a lighthouse and a carillon tower, the buildings comprise three types of structure: three long exhibition galleries, walled with glass, which run against the contours and are joined by connecting links of similar section; next a round shell-like structure in the middle of the layout which shelters the Zuider Zee exhibit; lastly, the long, curving timber building which runs along the bottom of the site and houses the agricultural sections and a restaurant. The glass-walled galleries have steel-frame roofs, the construction of which is concealed by a small-scale pattern of painted slats. The roofs are supported by two lines of precast post-tensioned concrete beams running the length of each pavilion (one pair of beams is 280 ft. long) and supported at 70-ft. centres by columns of the same material. The glazed walls are in two parts: the wall proper is formed of sheets of plate glass held in timber transomes supported on welded steel mullions. The top part of each glazed wall comprises a range of glass louvres suspended from the roof. These also serve to provide a louvred overhang at the ends of each block and to close the surrounding wall surfaces wherever a linking section runs into a main block at a low level.

Inside the shell-like structure which stands in the middle of the site artificially-produced waves break continuously in a glass-sided trough, so that each wave is seen in section. The structure owes its shape to the desire to reproduce the reverberant sound effect of waves breaking on the shore. It is built up of a series of welded lattice steel trusses with curving top and bottom booms which rise at each end from an



31. looking down the stepped terraces crossed by brick pathways and intersected by canals, that occupy the centre of the Netherlands pavilion. Note the neat barked timber edging to the raised lawns. Beyond the trees is the shell-like structure containing the Zuider Zee exhibit, 13 on plan, which is shown close-to in 32. On the left is the pumping-station for the wave-making machinery. The photograph is taken from within the shipping exhibit, 15 on plan, whose louvred overhang (see facing page) can be seen at the top.

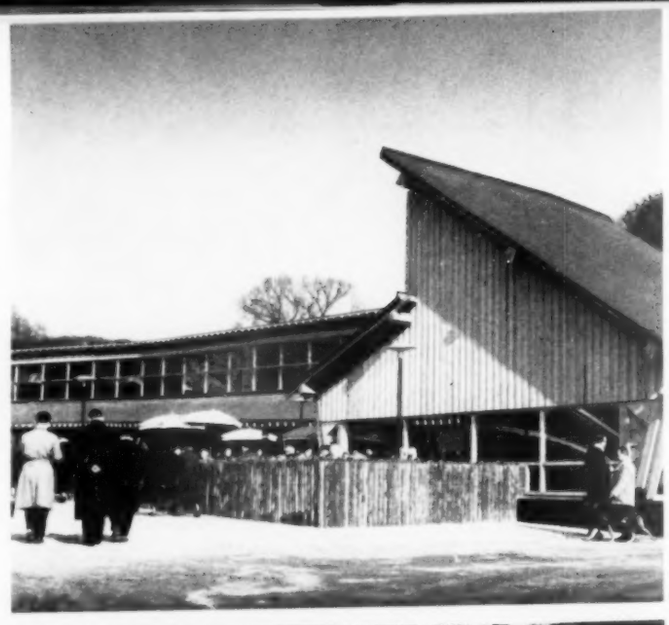
31



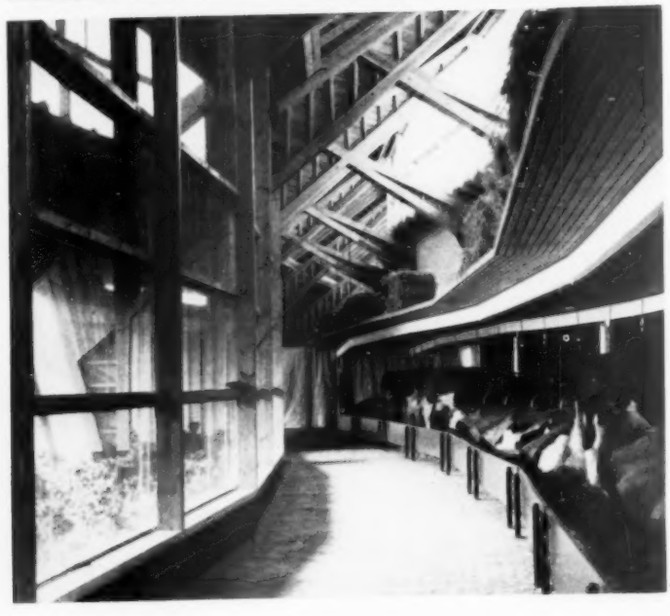
32

in situ steel 'hub.' Brackets project from the bottom booms of the trusses and to these is welded the steel mesh reinforcement of the shell itself. Concrete is then sprayed on to this, both sides, to give a skin of about 2-in. thick. The concrete shell stops short at the two top segments to give light inside and these are covered with translucent canvas.

The timber agricultural pavilion, which houses livestock, is of virtually constant cross-section throughout its length and is formed by a long series of raking trusses designed to give a deep clerestory to light the passageway and to give good ventilation and shading control for the animals.



33



34

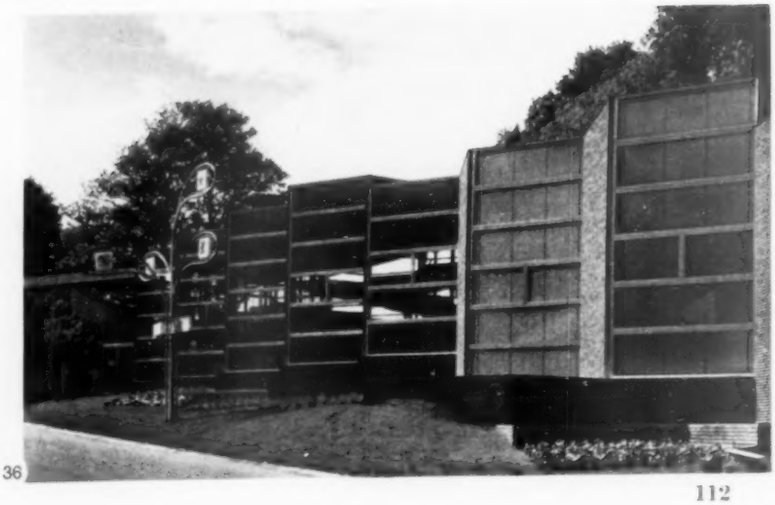
33 and 34, outside and inside of the agriculture building (8-10 on plan) on the south-eastern boundary of the Netherlands site, which has the form of a winding timber barn, housing livestock.
35, looking across the pool with artificial waves, towards the carillon which stands in the terrace by the entrance to the pavilion. On the left is one of the open-fronted galleries, 21 on plan, devoted to aviation.

35

5. SPAIN

architects: R. Vasquez-Molezun and J. Antonio Corrales

Standard hexagonal units are placed contiguously to form an irregularly shaped hall, and are raised or lowered to suit the uneven site and to form a stepped-up roof, providing clerestory lighting. The units are best described as a series of umbrellas. In the centre of each, on plan, is a tube support. The head of this tube is stiffened by six welded steel fins. This stiffened tube head then receives the roof proper which comprises six triangular frames formed of welded mild steel T-sections with timber infilling panels. These are bolted to a central hub with six supporting arms welded to a central tube,



36

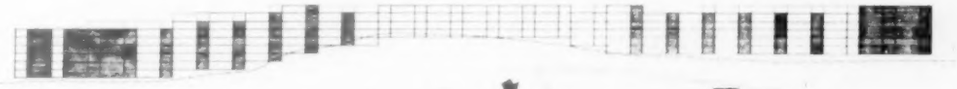
36, from the north, showing (right) the part of the building where brick panels alternate with glazed panels.

which drops inside the column. Each triangular section of roof is bolted along its edges to adjacent triangular sections and the whole is covered with aluminium. The tubular columns also serve as down pipes and, as they are in line, they are connected beneath the floor by a drain laid to falls.

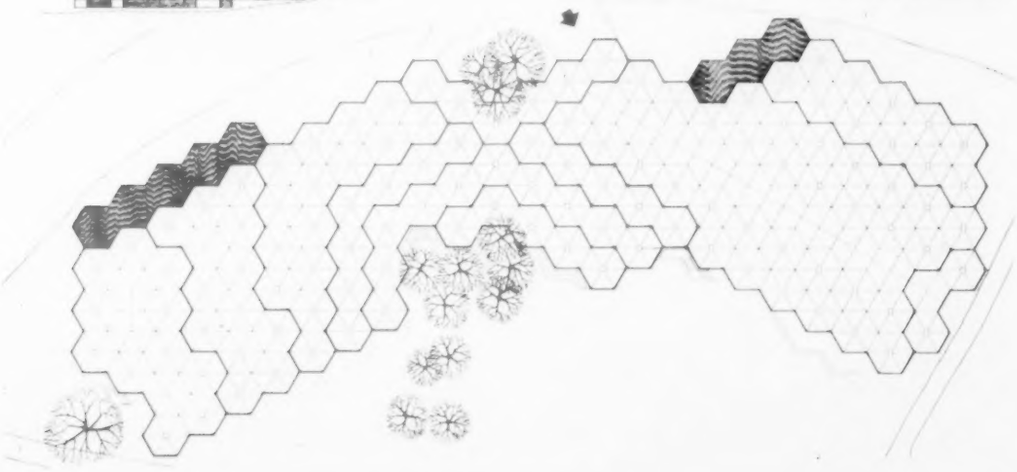
The walls of the building are partly of brickwork and partly glazed. Along certain sections of the façade the glazing alternates with the brickwork. At night the pavilion is lit by screened fluorescent tubes which follow the bounding lines of the hexagons.

Inside the floor is built up in stages, the topmost stages being occupied by a bar. These are designed to give a view of the raised dance-floor in the centre of the building. The only totally enclosed part of the pavilion is a cinema.

developed elevation



roof plan showing
evels of hexagon units

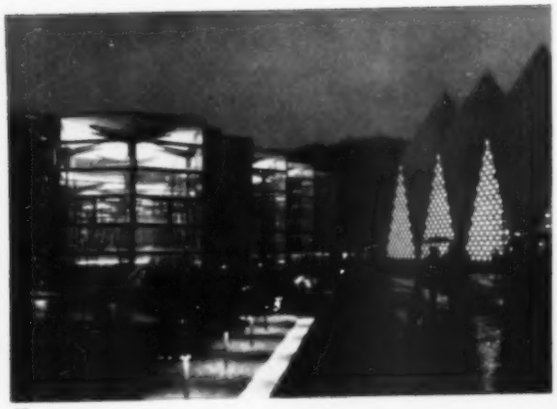


37

38

39

37 (left), the almost empty interior from the raised platform containing the bar, showing the clerestory lighting provided by the changing levels of the umbrella-like roof-units.
38, close-up of exterior, showing the faceted glass wall-structure.
39, another interior, looking up the terraced platforms towards the bar. In the foreground are some of the low hexagonal stands displaying photographs.



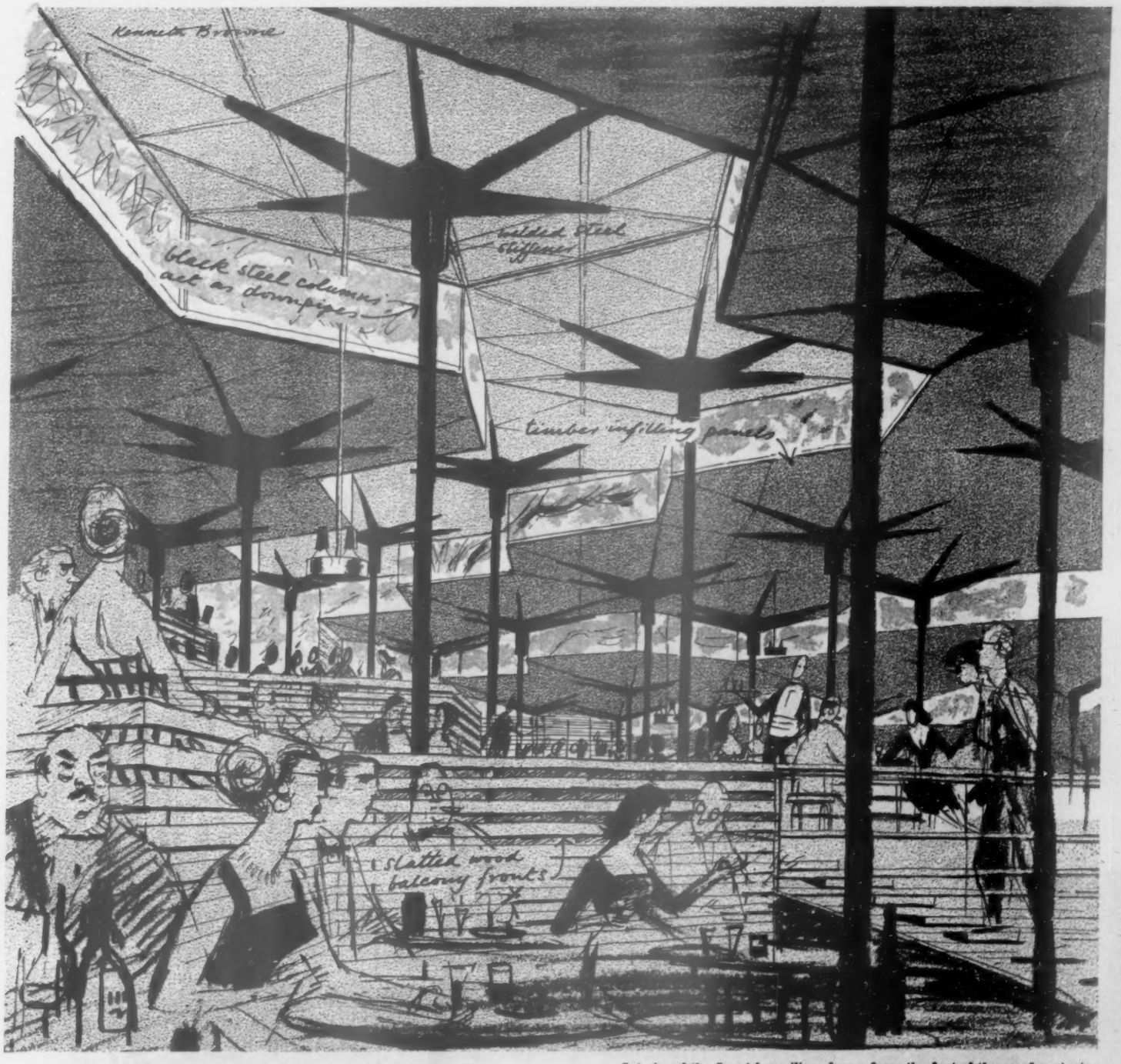
40

41

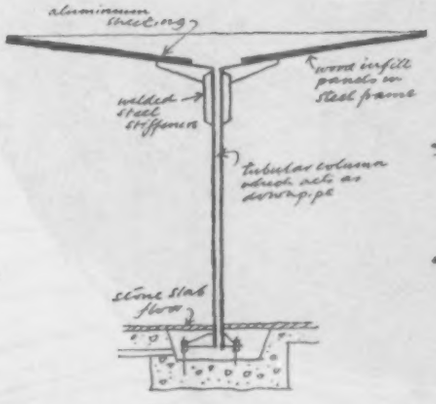
SPAIN

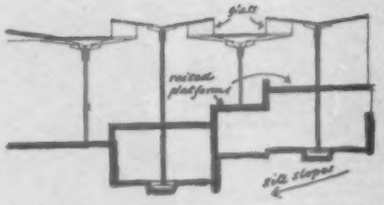
40. the Spanish pavilion at night, showing the effect of the ceiling illumination. The photograph is taken looking northwards down the avenue that separates Spain from Gt. Britain, and on the right are the lighted-up triangular side walls of the British Hall of Tradition.
41. inside the Spanish pavilion when the ceiling lighting is switched on.
42. a centre-pivoted plate-glass door leading direct on to the upper platform, where the bar is placed, from a garden behind the pavilion, to which the ground rises steeply. This photograph also illustrates the transparency in all directions, and the sense the visitor has of the presence of trees, seen through the glass or reflected in it, which are among the charms of the Spanish pavilion.

42

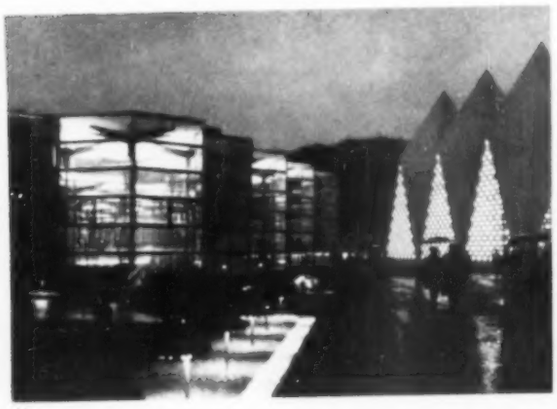


Interior of the Spanish pavilion, drawn from the foot of the wooden staging that builds up towards the back of the building and on which is placed the bar.





Left, section through the standard umbrella-like roof unit of which the whole structure of the building is composed, and a cross-section through the building showing how these units are stepped up the slope (the length of the stem being varied as necessary) and differ in height to provide clerestory lighting.



40

41

SPAIN

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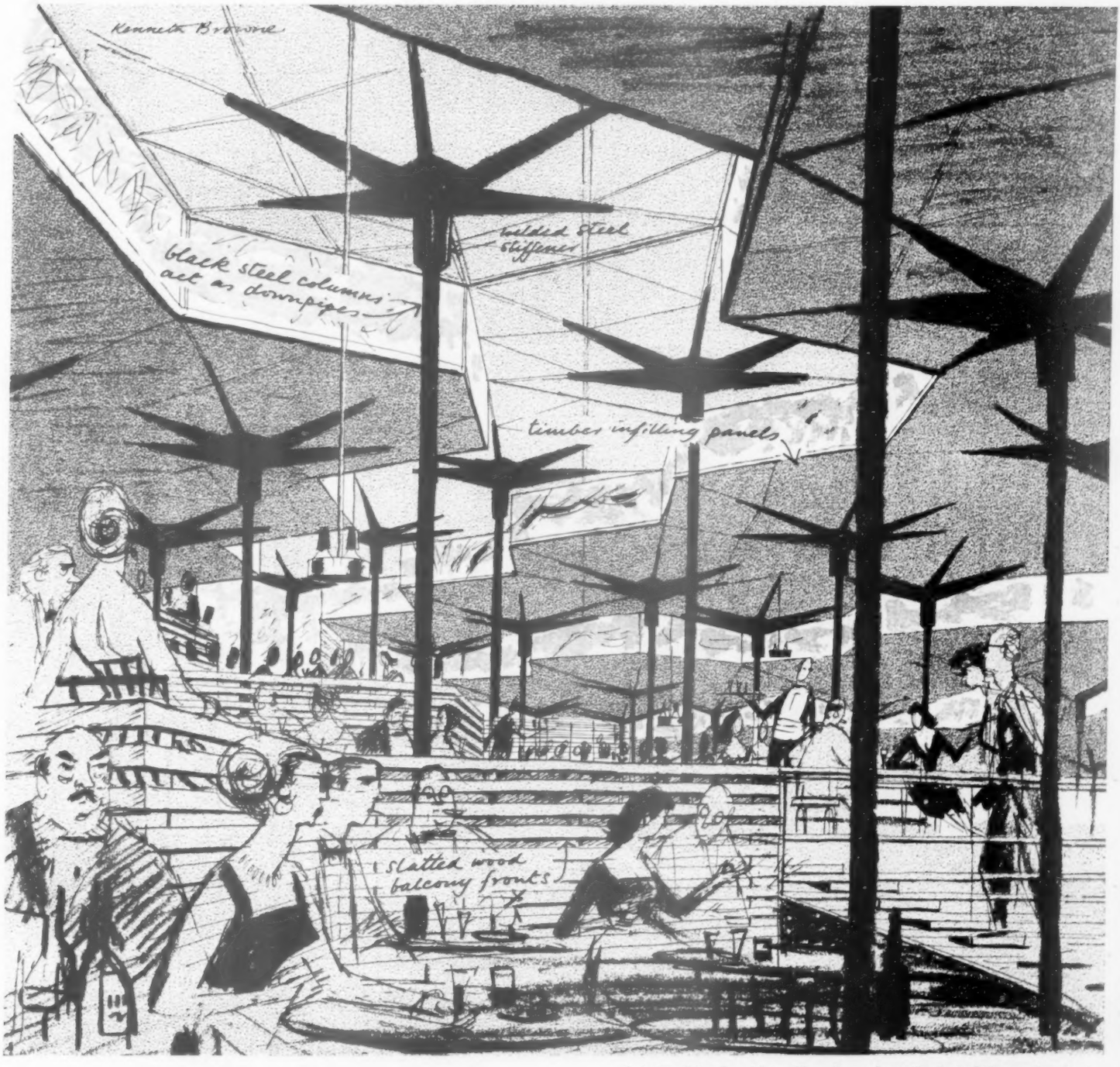
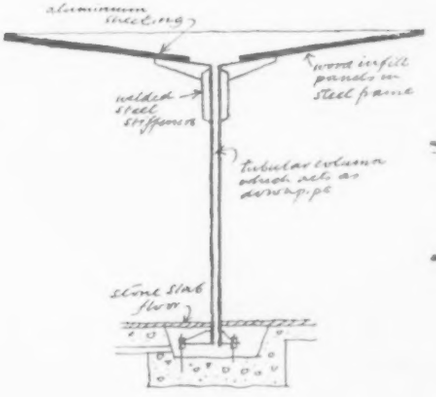
41. Inside the Spanish pavilion when the ceiling lighting is switched on.

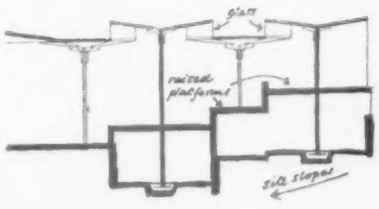
42. A centre-pivoted plate-glass door leading direct on to the upper platform where the bar is placed, from a garden behind the pavilion to which the ground rises steeply. This photograph well illustrates the transparency in all directions and the sense of the visible life of the presence of trees seen through the glass or reflected in it which are among the charms of the Spanish pavilion.

42



Interior of the Spanish pavilion, drawn from the foot of the wooden staging that builds up towards the back of the building and on which is placed the bar.





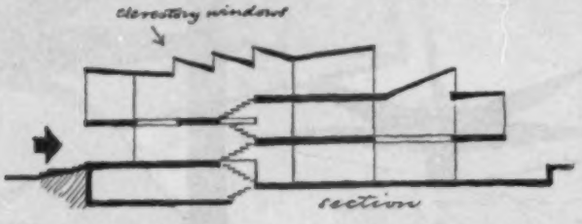
Left, section through the standard umbrella-like roof unit of which the whole structure of the building is composed, and a cross-section through the building showing how these units are stepped up the slope (the length of the stem being varied as necessary) and differ in height to provide clerestory lighting.

6. JUGOSLAVIA

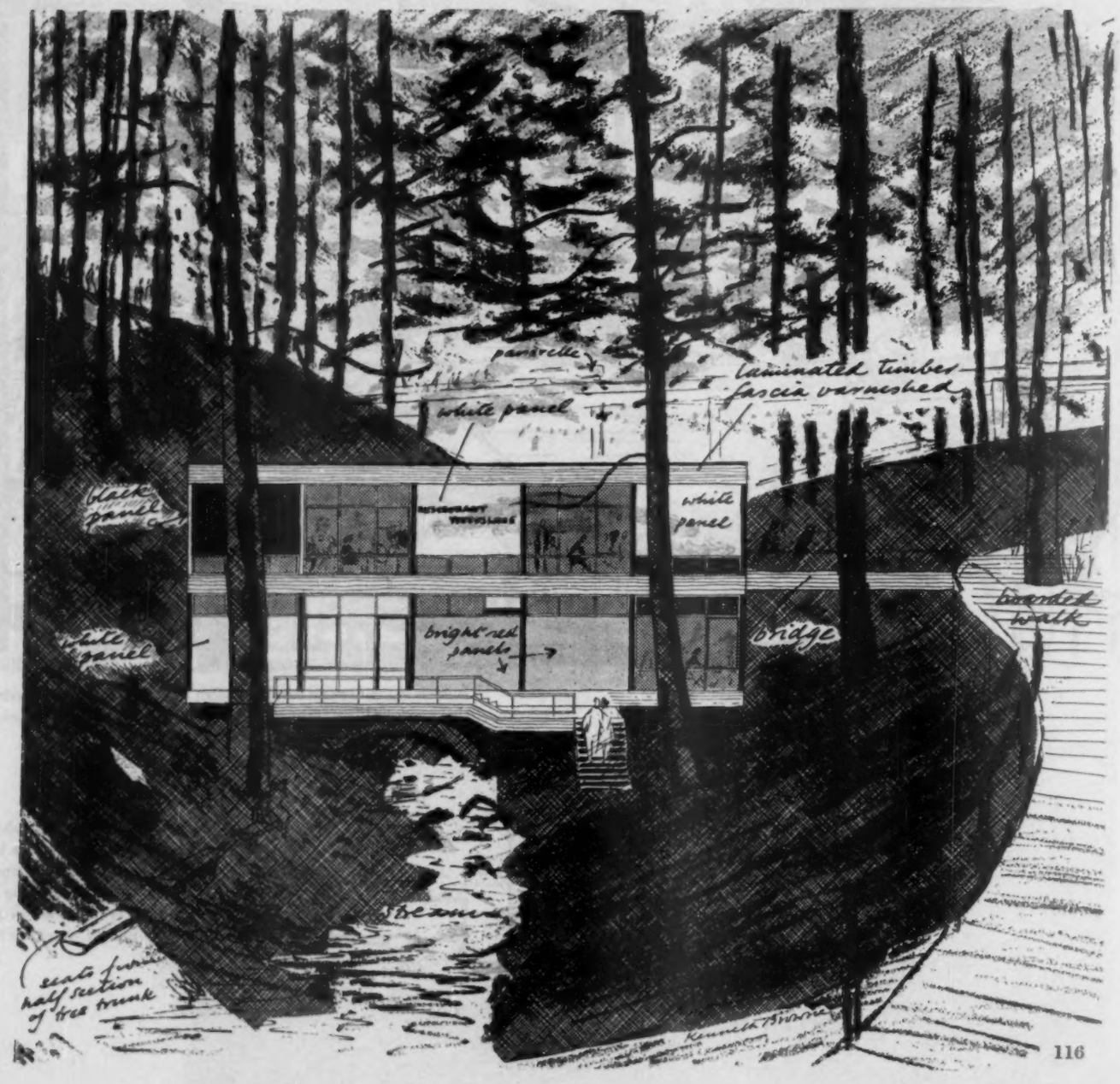
architect: Vjenceslav Richter

Three rectangular galleries of different heights and at different levels are raised above ground and interpenetrate round a common staircase. The structure is of steel throughout, the steel stanchions being placed invariably some 14 ft. inside the building line. Another, outside, staircase leads direct from the upper galleries to the paved terrace across the front of the building. This is protected by the cantilevered overhang of the superstructure and has a timber boarded soffit.

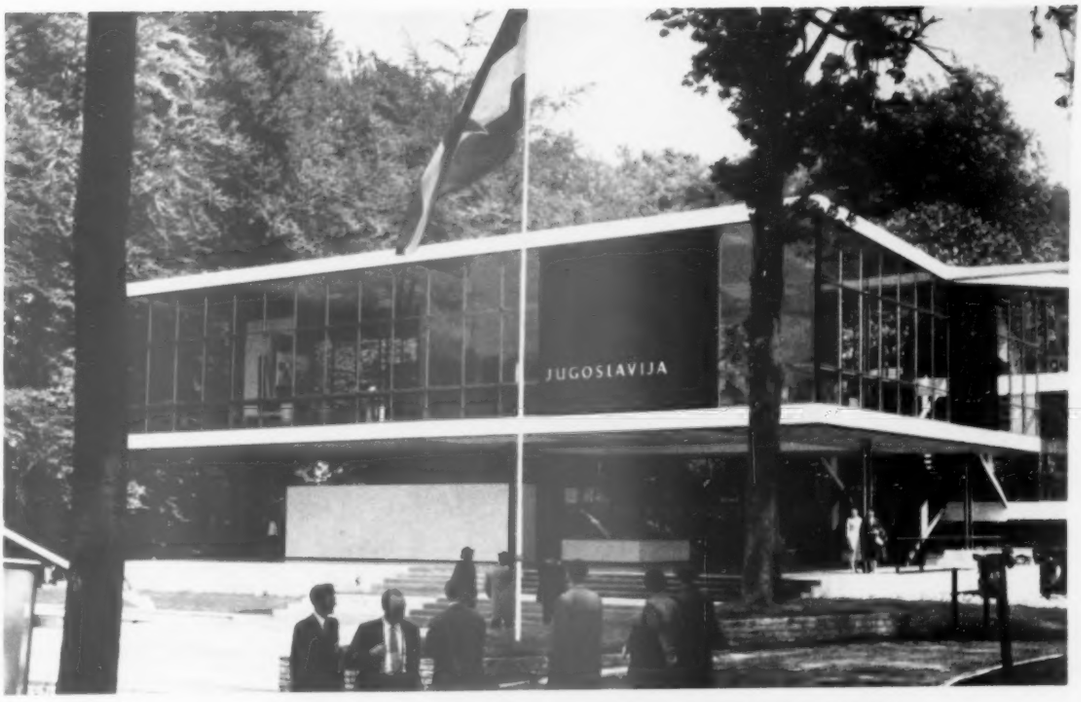
The upper galleries are lit through a series of clerestory windows curved in elevation which create interesting geometrical shapes where their inside surfaces intersect the ceilings. All ceiling surfaces are of close timber slatting which throw changes in contour into relief. Fascias are of hardboard painted white and the occasional sections of solid walling are clad in vertically ribbed plastic panels of a purple colour. The ground floor is laid with polished marble.



Below, the western side of the Jugoslav restaurant, built over a stream across the road from the main building. Its other side is shown in 45 on the facing page.

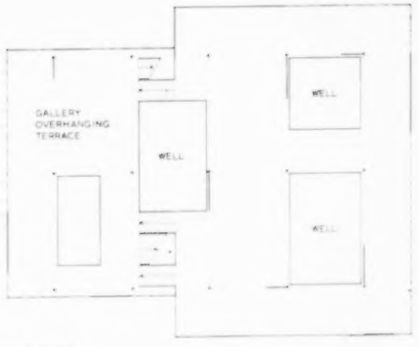


43. the entrance front of the Jugoslav pavilion, with main first-floor gallery cantilevered over a marble-paved terrace (see also next page).
44. the opposite side of the pavilion at night, showing the curved clerestory lights projecting above the roof. Across the road from the northern end of the pavilion (i.e. among the trees seen in the background on the left of 43) is a two-storey restaurant. 45, spanning across a steep ravine so that the stream runs beneath the building, and reached by a bridge. The photograph shows the opposite side to that shown in the drawing on the facing page.

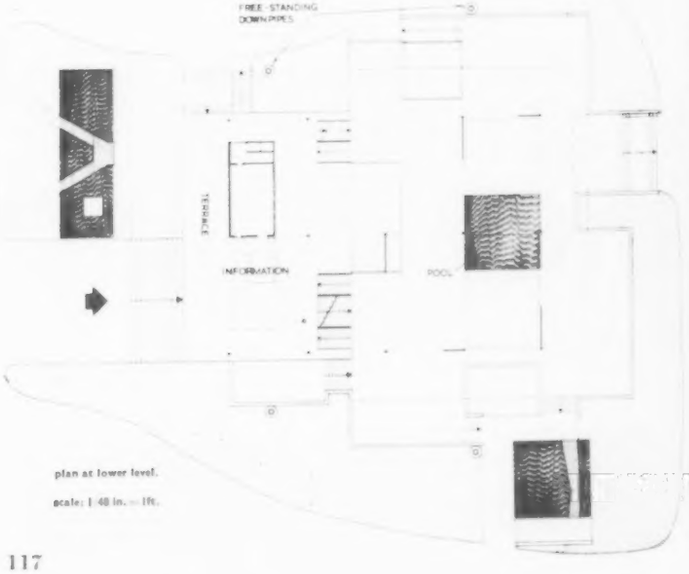


43


44



plan at upper level.



plan at lower level.

scale: 1·48 in. = 1ft.


45

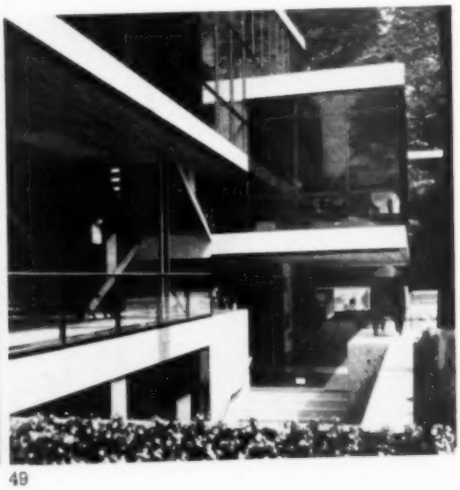
46

47

JUGOSLAVIA

46. the corner of the main pavilion from below, showing the projection of the first floor gallery to form a roof to the terrace across the front.
47. looking along this terrace towards the steps shown in 46. The soffit of the oversailing roof is narrow timber boards, in which lights are set. The pavement is polished marble of a pinkish colour. The two photographs below show the complex inter-penetration of spaces inside and out.
48. the view outwards from the centre of the building, also shows the interesting ceiling shapes that arise from the use of curved clerestory lights. The ceilings are lined with timber.
49. the projecting end of the first-floor wing, of which the corner is shown in 46.

48

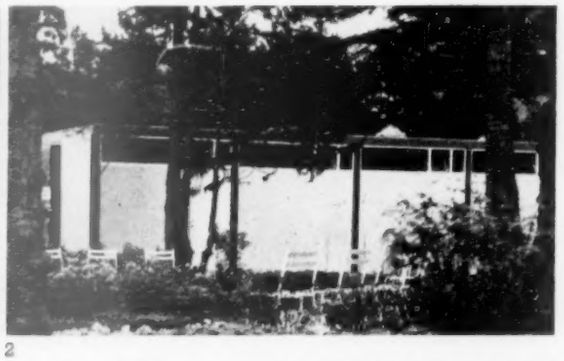


49

TOWNSCAPE AND OTHER DETAILS

An exhibition is a temporary town, requiring the solution of the same problems of detail that confront the town-designer and that make so much difference to the quality of the visual picture it is his job to create. Exhibition buildings, moreover, though fulfilling a specialized purpose, contain many details, inside and out, of the same kind that the architect is always having to provide in his buildings. On the following pages, townscape and other details that seem worth the architect's attention are gathered from all over the exhibition, together with a few cautionary examples to remind the reader of how disastrously uneven detailing in the modern idiom still is, in Brussels as elsewhere. The architects of the foreign pavilions, from which most of these details are taken, are named on page 86.

1

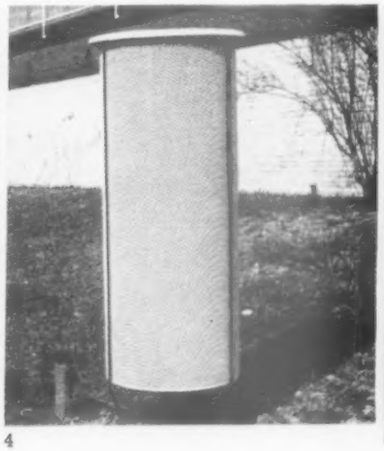


2

temporary structures

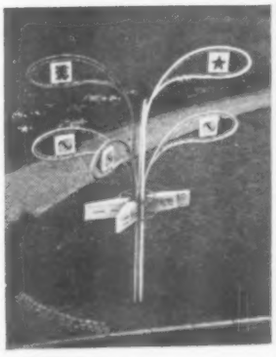
Each entrance to the exhibition has a different design, though the glass and metal payboxes are standard. 1 is the best: the *Porte des Nations*, at the eastern end of the main avenue through the foreign section, with folded plywood roof sheltering the payboxes (architects, P. Guillissen and J. Koning). 2, the neatly designed standard steel-framed lavatory block (architect, F. Van Hemelrijck).

3



4

5



6

7

street furniture

The street furniture is standardized throughout the exhibition, the standard Belgian designs being used also in the foreign section except within the curtilage of individual pavilions. Some, above, are of neat and appropriate design; others, left, are noticeably poor. 3, outdoor seat composed of curved units, used in this case to form a serpentine shape; they can also form a semi-circle; in natural varnished wood, with legs painted black. 4, loudspeaker for broadcasting music and announcements: cylindrical cage of pierced metal, painted white, supported by steel rods painted black. 5, light-fitting for use near the ground on grass and under trees: steel rod painted black; white glass shade.

Two cautionary examples: 6, the standard signpost, indicating by symbols the direction in which the different sections of the exhibition lie: weak curves formed in neon tubing, each arm in a different colour. 7, the equally weak shape of the structure housing stamp-machines, etc.: in steel tube and obscured glass.

8

9

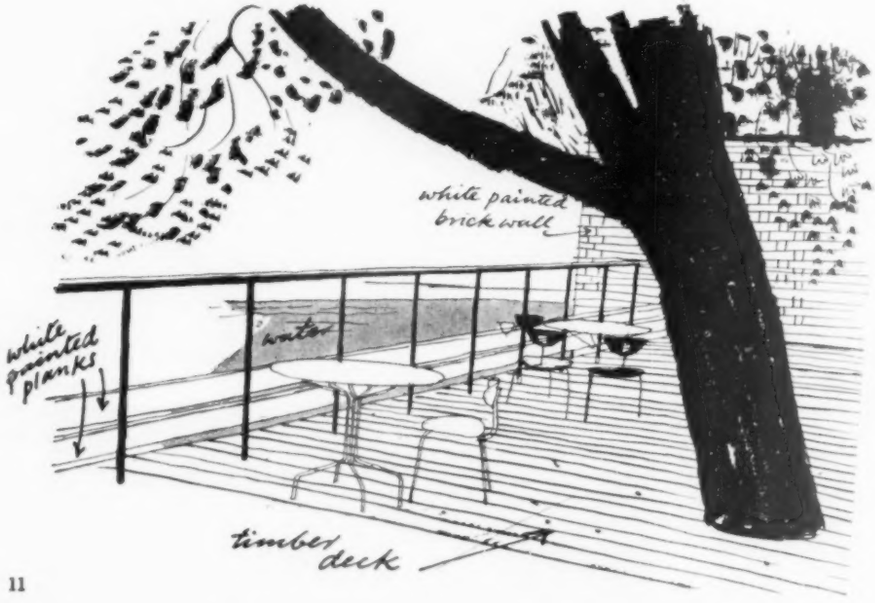
10

street furniture

Three well-conceived examples of street furniture from the foreign section, designed by the architects of the pavilions on whose sites they stand: 8, a German litter-basket, in wicker set in a wire frame; 9, a Dutch floor-box, in exposed aggregate concrete—the undercut base enables it to take up the slope of the pavement; 10, a Dutch seat in polished hardwood with dovetailed corners.

buildings and trees

The exhibition grounds, especially in the foreign section, are well furnished with trees, and some of the architects have used them effectively in close relation to their buildings and their approaches. One tree grows through the deck of a small terrace, 11, that is reached from the garden courtyard section of the British pavilion and overlooks the boat-pool. Trees similarly rise through the timber planking of the walk, 12, that separates the main Swiss pavilion from the Swiss transport exhibits, but here the bases of the tree-trunks can be seen from beneath the walkway, looking along the ravine. At the back of the Spanish pavilion, 13, the building is surrounded by trees which stand close to the glazed walls, giving skilfully contrived views of greenery from within.



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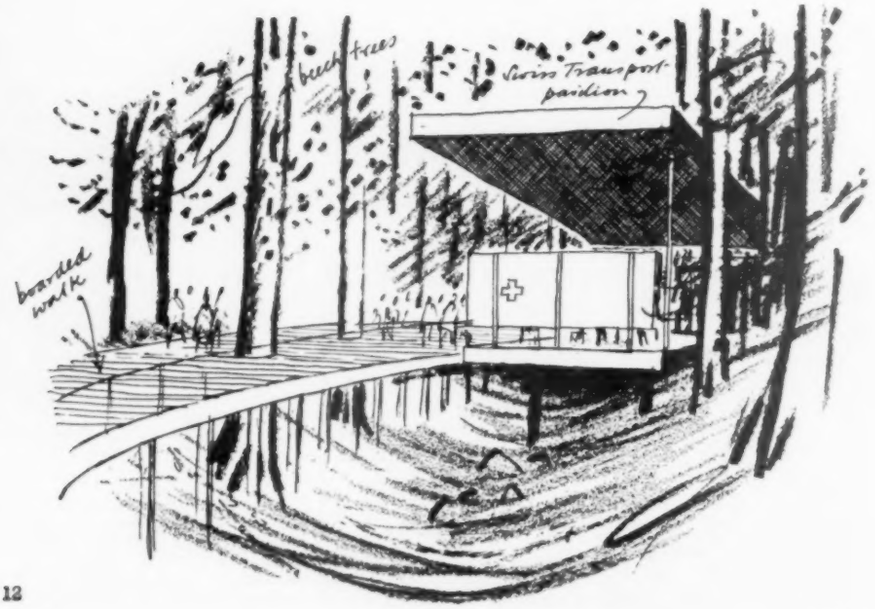
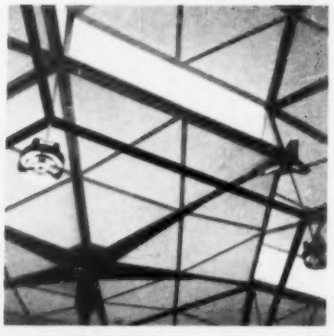


12

the timber ceiling

14

16



17

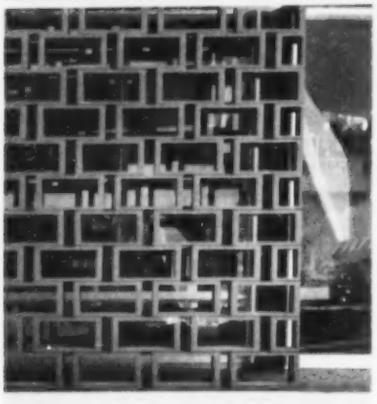
18

15

The foreign pavilions at Brussels demonstrate the remarkable variety of effect obtainable by the use of timber for ceilings. In the Yugoslav pavilion, 14, the whole roof is lined inside with close timber boarding, the interest of whose texture is enhanced by the play of light on the intersecting planes created by the segmental roof-lights. The Finnish pavilion, 15, has a false ceiling of timber rafters hiding the actual roof structure and also serving to screen the source of light—hence the projecting panels. Each unit in the Italian pavilion, 16, is roofed with exposed timber beams and boarding, the beams resting on concrete columns designed, it would seem, to emphasize as strongly as possible the contrasting harshness of this material. In the ceiling of the Spanish pavilion, 17, timber is used in the form of a light flat panel to fill in the triangular spaces between a framework of steel members. The Norwegian pavilion, 18, uses very heavy laminated timber beams, in pairs bolted together, between which is stretched a plastic material with something of the character of parchment.

the window wall

19



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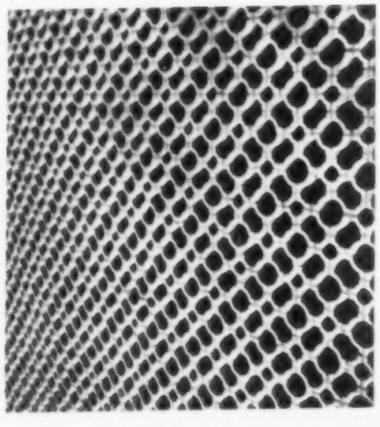
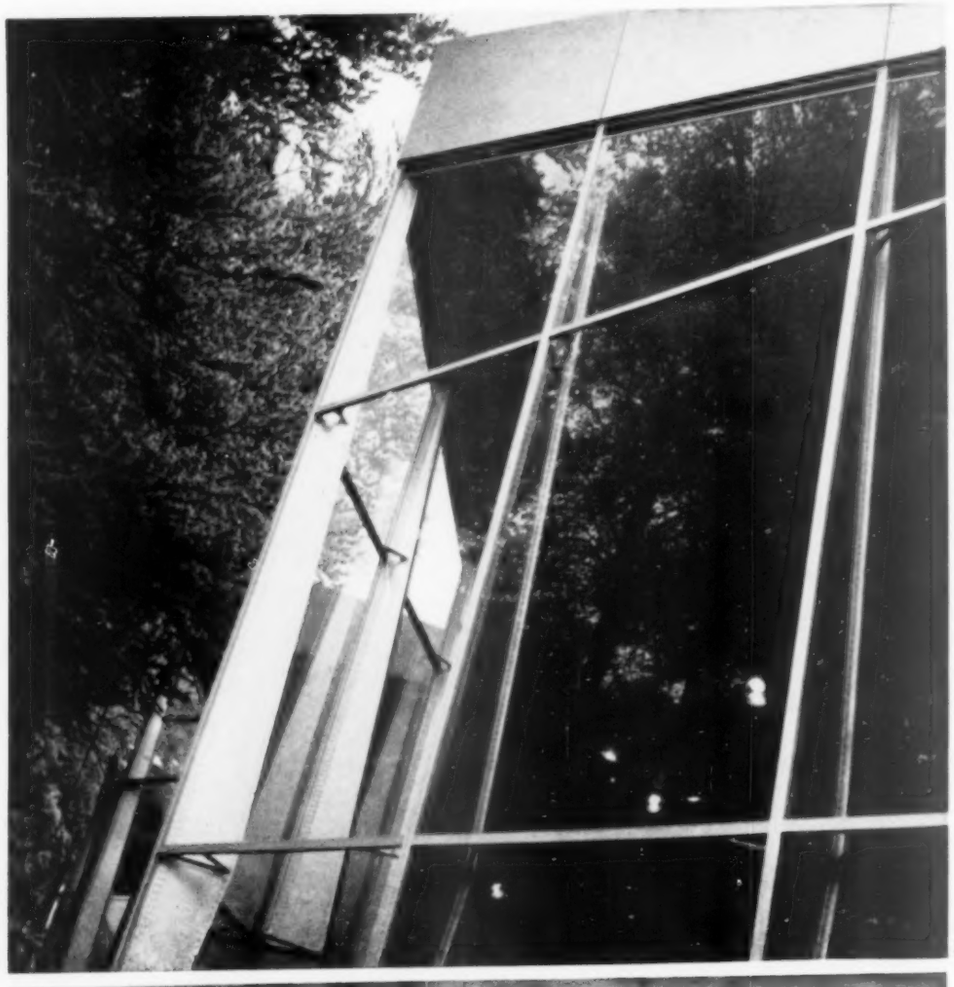


21

Framed buildings predominate in the exhibition, which means that windows and walls are one, and architectural character depends on the weight and detailing of the structure in relation to the glass infill. There are several unusually elegant examples of the metal and glass window-wall, notably the Austrian pavilion (19 shows the internal angle of the courtyard with the wall on one side recessed to form a balcony) and the Swiss, 22, on the right, glazed on the outer face with fin-like stiffeners inside. Some glass walls are protected from the sun by a ceramic grille, as in the Portuguese pavilion, 20, where the grille is of superimposed rectangular blocks, and the US cinema building, 21. In the restaurant of the Turkish pavilion, 23, protection is given by timber grilles fitted into the steel frame and timber panels that hinge upwards over the windows.



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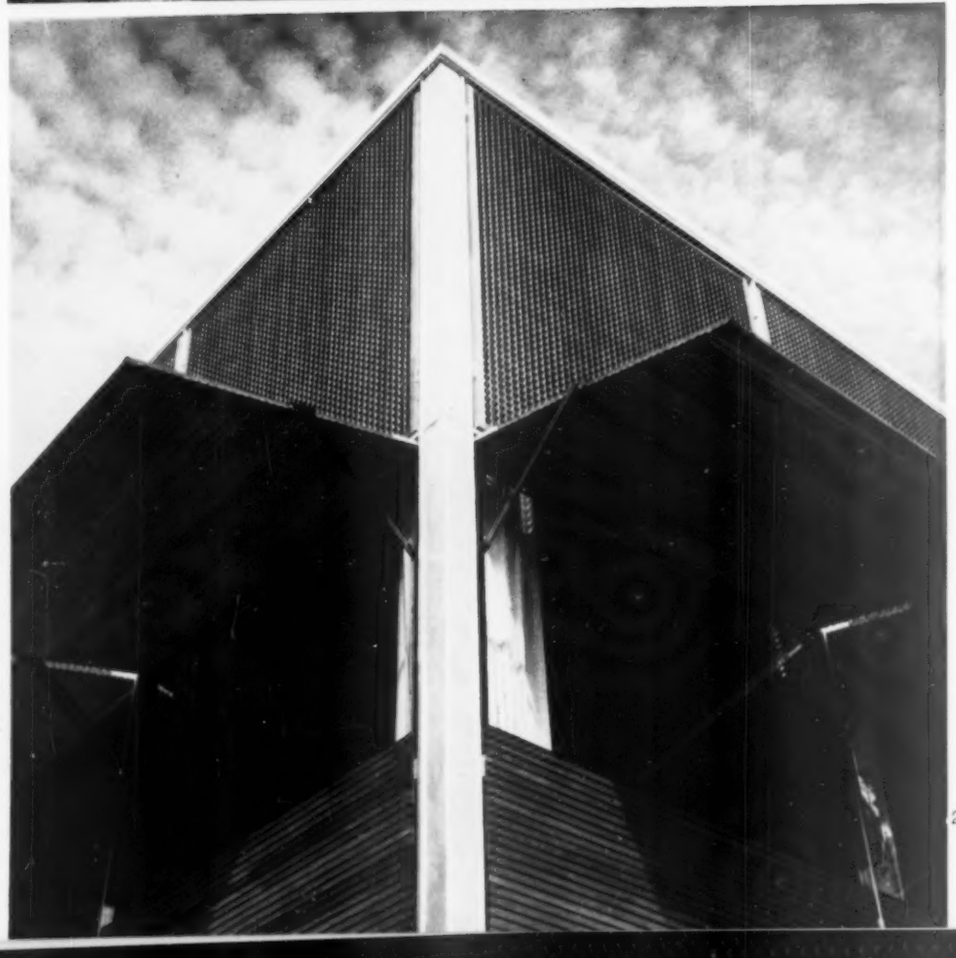

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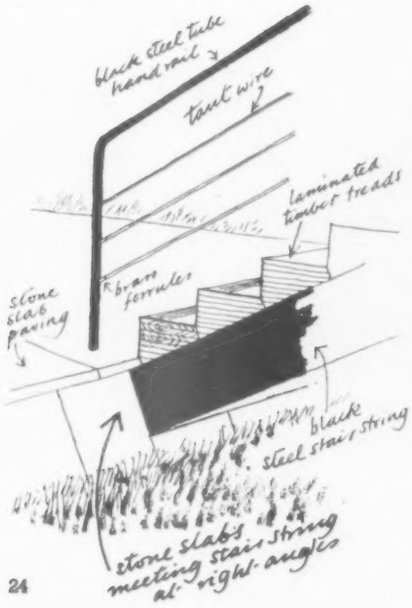
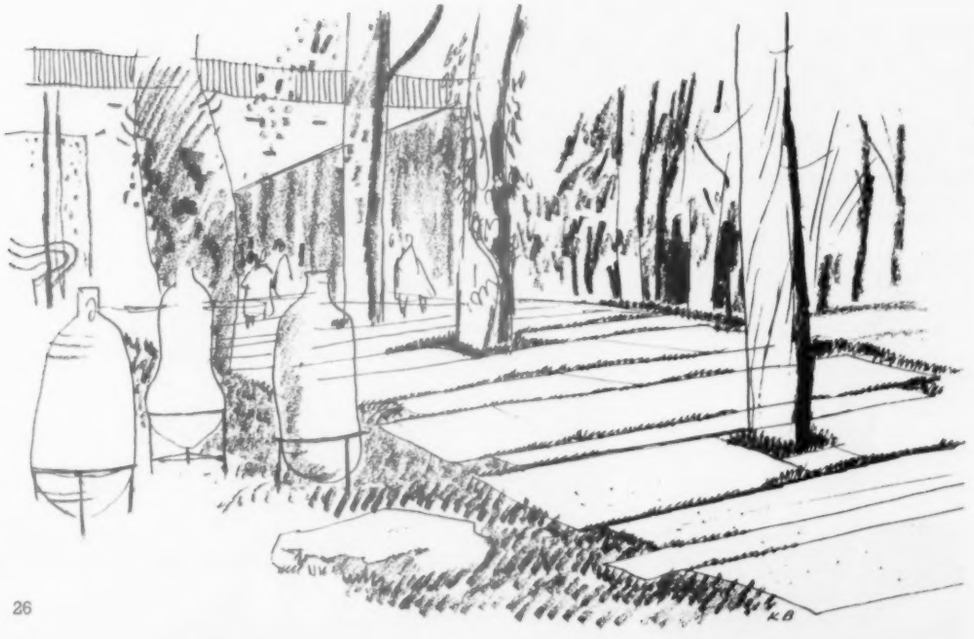


24

25

24, the neat finish at the foot of an outdoor stair leading down into one of the paved and grass-planted courtyards of the German pavilion. The grass ends at a sloping stone slab against which the steel string of the stair abuts. 25, the isolated step: the granite step that leads down from the terrace of the Norwegian pavilion is engagingly brought a few inches forward so that the grass grows all round.

steps



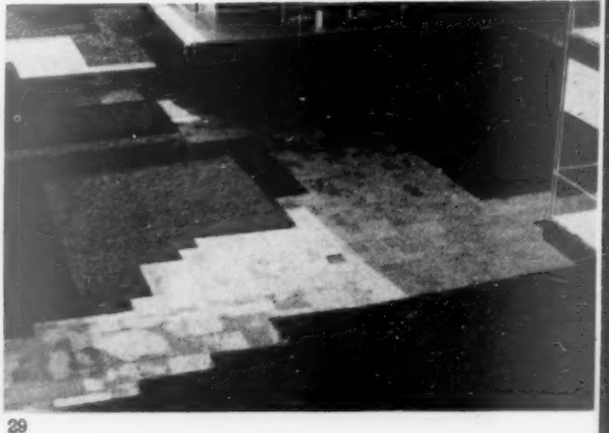
26

paving patterns

Like the Norwegian steps above, the approach to the Israeli pavilion, 26, gets a charming effect by encouraging grass to grow between stone paving slabs. The slabs, interrupted by the trunks of trees, are informally laid with alternating wide and narrow courses. Below, three examples of interesting patterns obtained by the use of stone paving: 27, random square, circular and irregularly shaped pieces, arranged in panels separated by occasional straight joints, in the terrace surrounding the pool of the Swiss pavilion. 28, fine gravel alternating with irregular squared-up stone slabs in the garden courtyards of the British pavilion. 29, the well thought-out junction of stone paving and grass in the courtyard of the German pavilion.

27

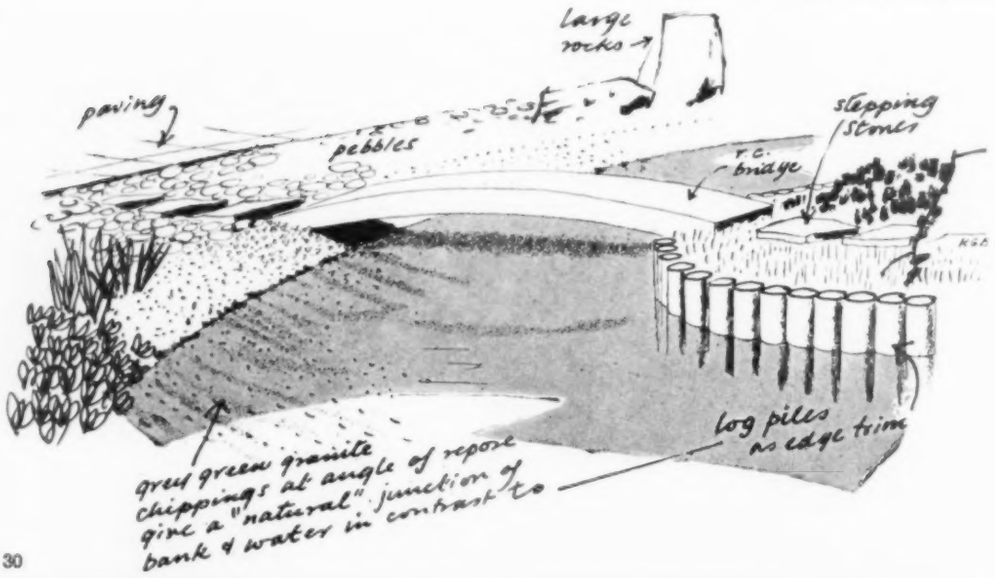
28



29

stones and water

On the right, two examples of a carefully planned relationship between stones and water: 30, rocks, pebbles and granite chippings surrounding the pool in the garden at the back of the Japanese pavilion, all used with the sensitivity to the natural properties of materials typical of the Japanese. 31, a fountain outside the German pavilion, consisting of flat discs of marble from the centre of which water bubbles and flows over the discs to saturate the pebbles among which they are set.



30

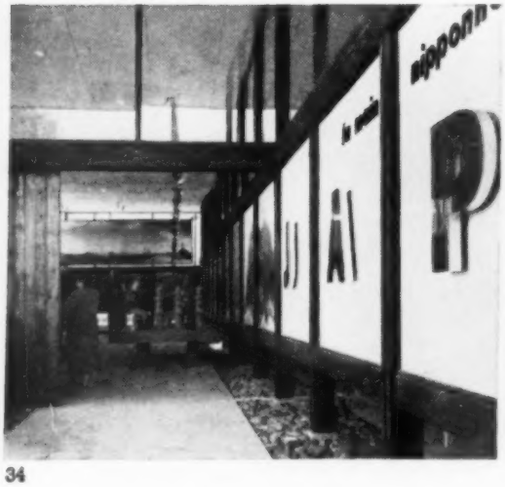
31

lettering on buildings

Contrasts in character: 32 and 33, the precise, mechanistic style of lettering on the aluminium fascia and in the garden of the Swiss pavilion; 34, widely spaced letters, raised and with their flat surfaces gilded, spelling out the name of the Japanese pavilion; 35, the main label of the Dutch pavilion—bronze lettering mounted on a granite block, itself supported on a wall of granite setts.

32

33



34

35

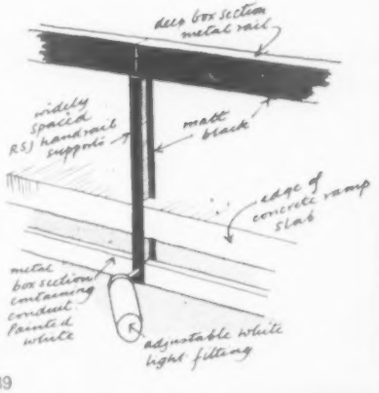
36

37

38

interior lighting

36, in the Italian pavilion: flat square metal boxes with glass bottoms, suspended from the timber ceiling. The use of materials 'as found' and the casual arrangement of the looped cords conforms with the style the Italian architects have employed throughout. 37 and 38, two standard types of ceiling fitting in the Spanish pavilion: a circle of naked bulbs in small metal holders and a fitting consisting of concentric circles of black metal screening a double light-source. 39, detail of the neatly designed system of lighting along the edge of the ramp that descends round the central garden (see page 91) in the Brazilian pavilion. 40, suspended fitting in the restaurant of the Swiss pavilion. The bulbs are sandwiched between plates of perspex. There is also concealed lighting behind the louvres in the ceiling, not illuminated in this photograph. 41, in the Finnish pavilion: slatted timber structure screening the source of light set between the ceiling rafters. 42, conical shades at the end of metal tubes used for lighting the modern art section of the French pavilion.



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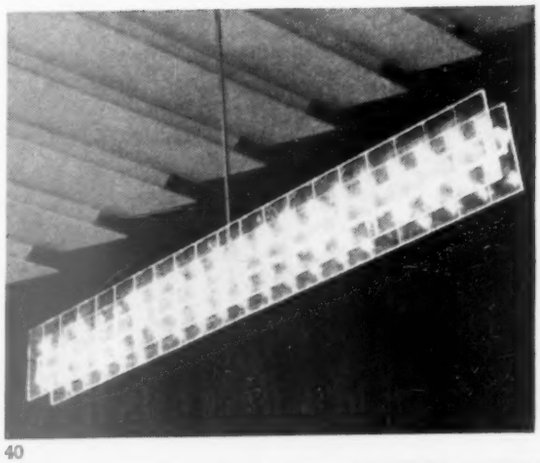


40

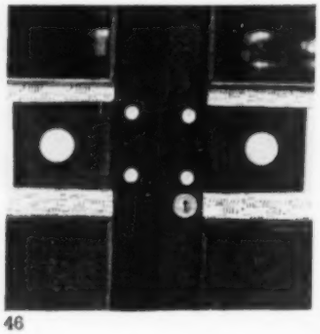
41

42

door details

Some door details. 43, the main entrance to the Finnish pavilion: an expressively heavy timber door (natural wood, polished) of the simplest possible shape—carpentry rather than joinery. 44, typical of the emphasis on materials 'as found' throughout the Italian pavilion: set without a frame straight into the brick opening is a sheer leaf of plate glass with minimum pivot-hinge and locking-plate of brass. 45, the opposite type of sophistication: the standard door between units in the German pavilion (see also page 104), exquisitely finished in painted plywood with hardwood edge, pivoting from the centre of a stretched polythene canopy—its character is that of aeroplane construction. 46 (below), a cautionary example, the fussily over-designed doorhandles in the annexe to the British Industry pavilion: timber frame, wired glass panels, plastic-faced cross-rails with modernistic texturing, in front of which project flat metal handles to which are applied white plastic rosettes.

43



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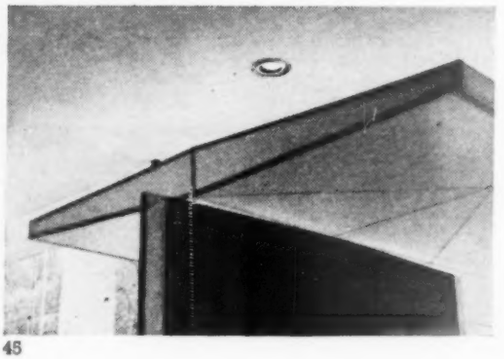
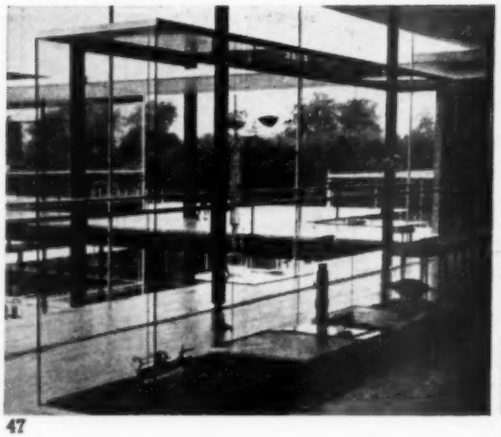


45

technique of display

Another contrast between sophisticated elegance of design in the German pavilion, 47, and deliberate brutality in the Italian, 48. In the German showcase the metal members at top and bottom are reduced to the minimum; between is sheet glass, presenting hardly any obstruction to the eye. Jointing and source of lighting are unobtrusive. In the Italian showcase, the side walls are roughly laid brick; glass shelves butt directly against it; the wiring to the light-fitting trails where it will.



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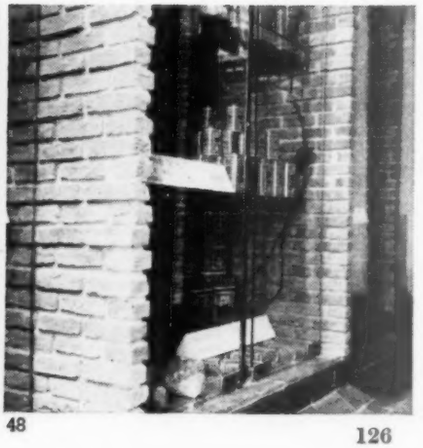

48

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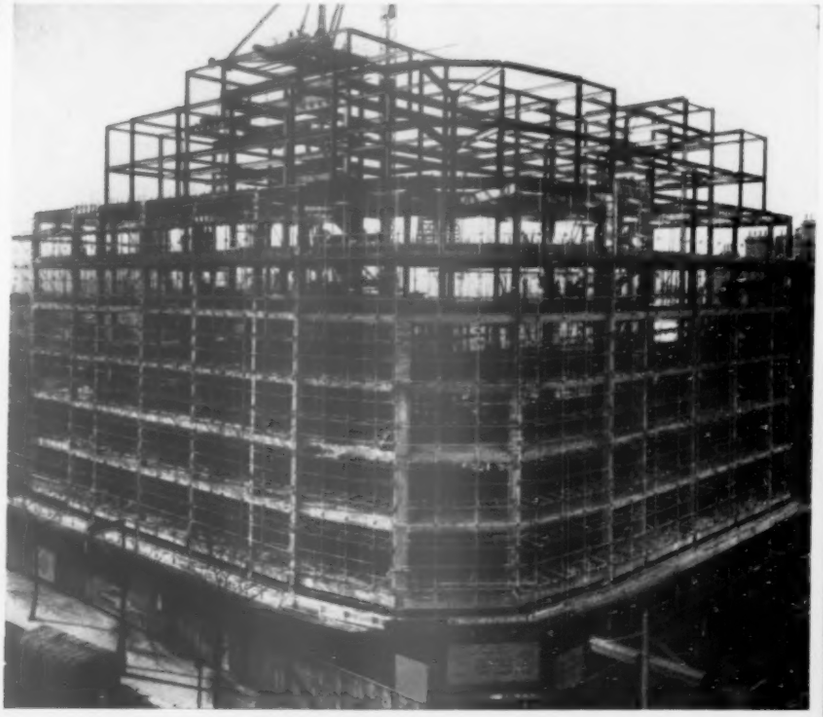

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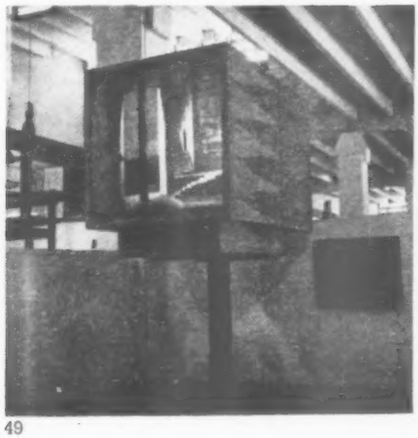

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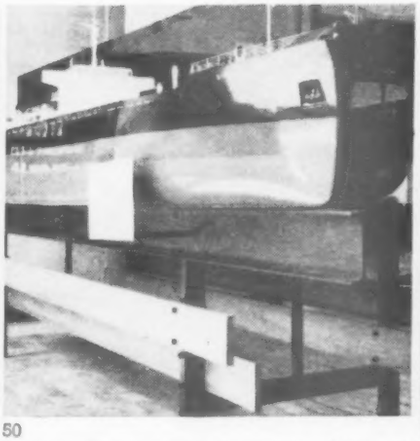

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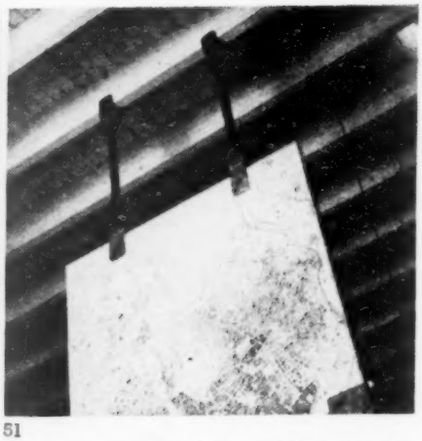
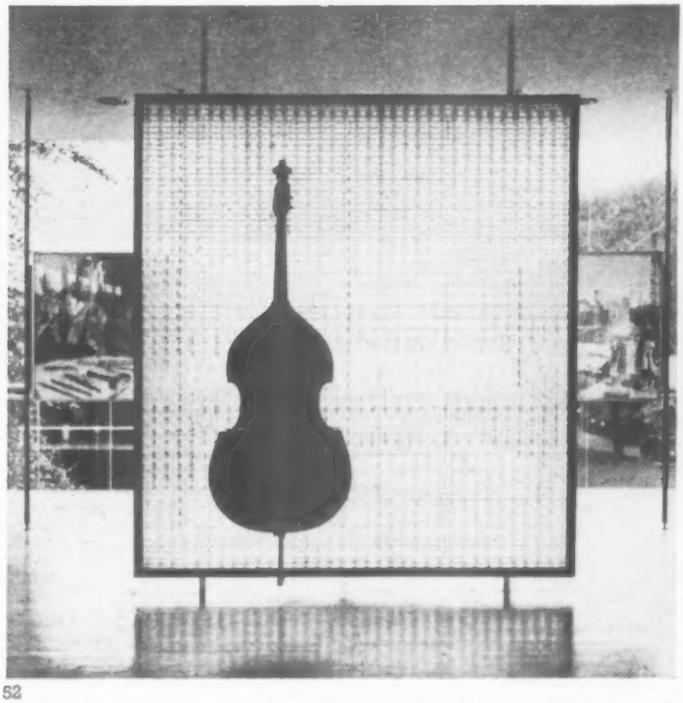


51

The Italian pavilion is notable for fertility of ideas about how to mount and display exhibits. Materials, mostly timber, iron and steel, are used in a forthright, ostentatiously functional way. 49, a box for showing films, of wood mounted on a steel column. 50, a stand for ship-models, of wooden planks and steel joists. 51, panels displaying maps and plans, suspended unframed from the timber ceiling by iron straps.

technique of display



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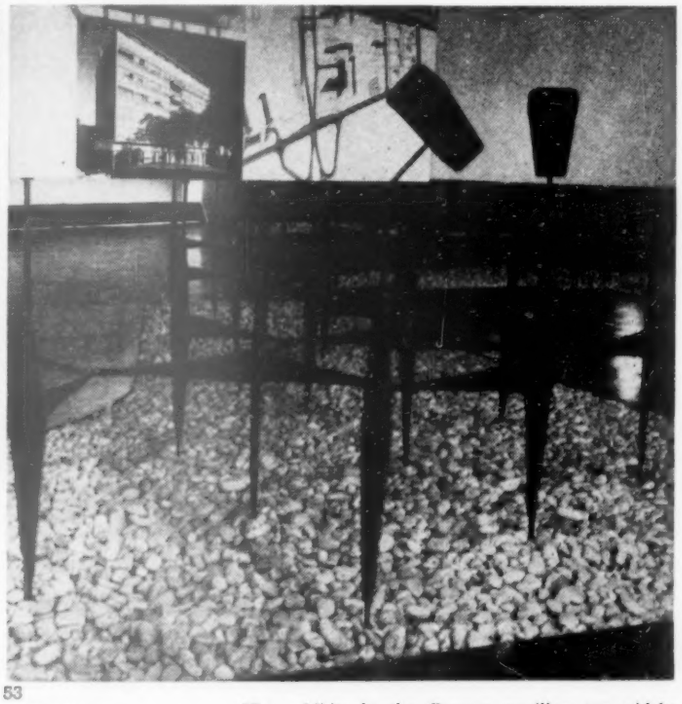
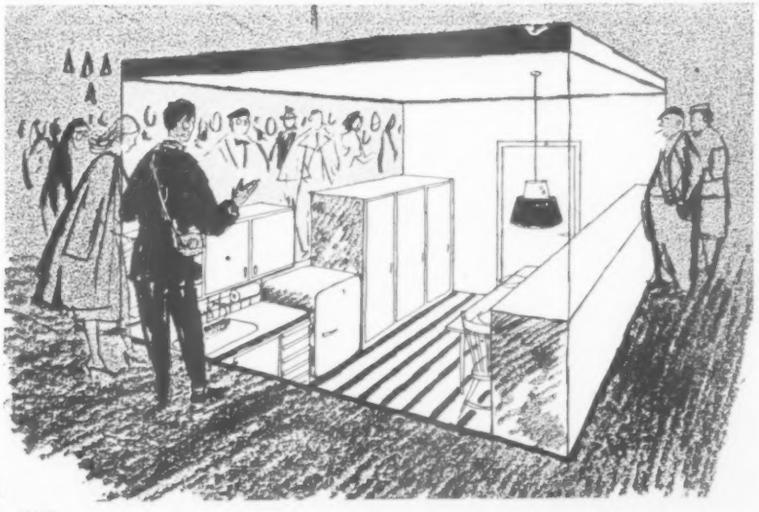


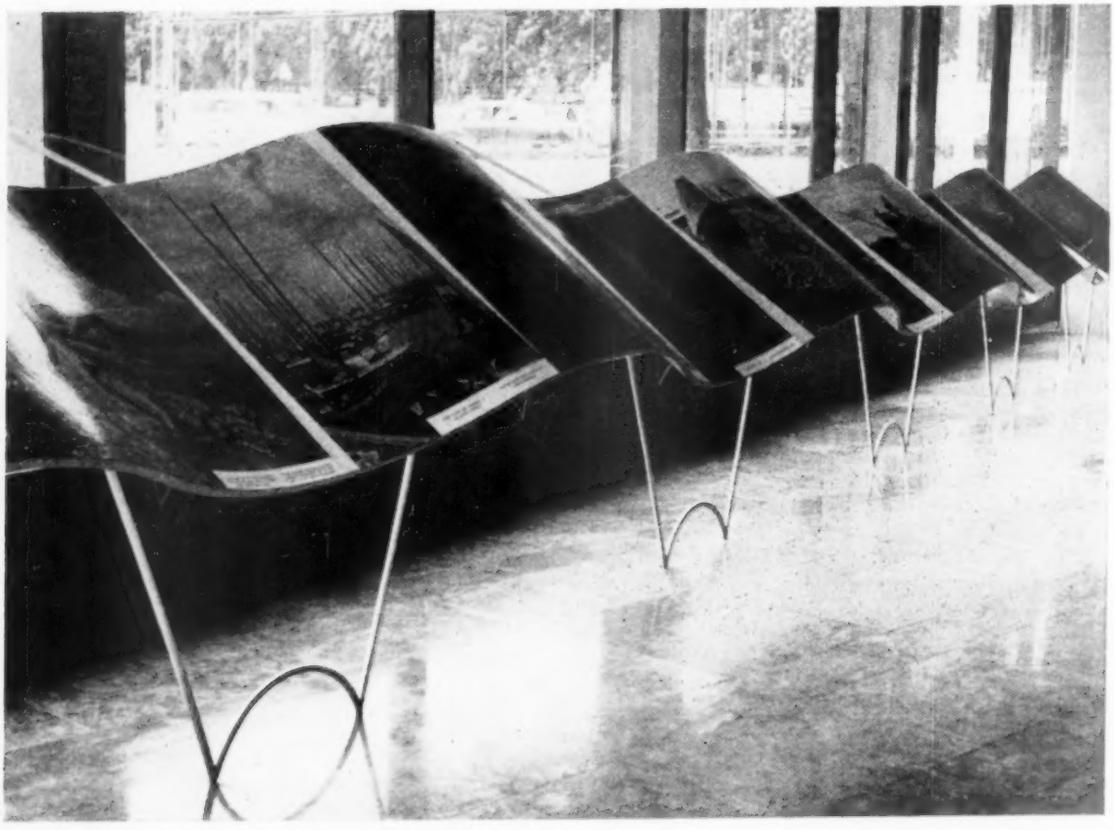
53

The exhibits in the German pavilion are widely spaced out and carefully positioned so as to provide the visitor's eye with a point on which to focus. 52, a cello seen in silhouette, mounted on a translucent screen filled with a plastic mesh. 53, in the Portuguese pavilion, a series of screens devoted to town-planning are mounted on a geometrical arrangement of angular, spindle-shaped iron legs, with connecting cross-pieces in similar style, all standing in a bed of pebbles.



54

54, inside the Finnish pavilion a model kitchen is easily viewed because the whole room is sunk into the floor and the visitors look down on it through its enclosing glass walls.



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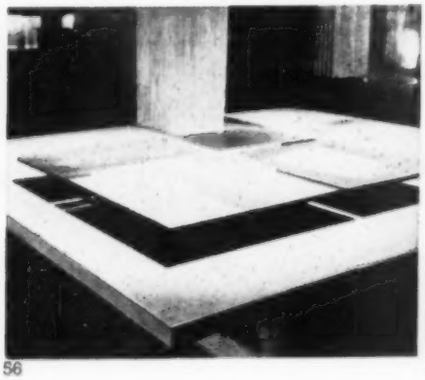


56

57

technique of display

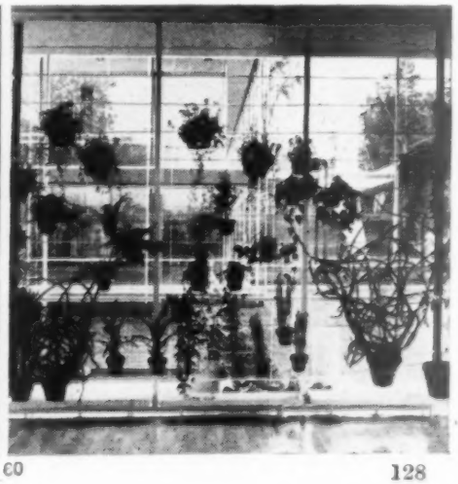
55, an unexpectedly light and decorative technique of displaying photographs in the Hungarian pavilion: on a tilted undulating plywood surface, supported on a metal frame. 56, small objects displayed in the Finnish pavilion by the simple but effective technique of placing them, on low tables, in wooden boxes and covering them with sheets of glass. 57, books and similar exhibits displayed in the Austrian pavilion in a kind of double lectern, elegantly framed in hardwood and fronted with glass.

indoor planting

Textures belonging to the garden used decoratively indoors in various ways. 58, in the Portuguese pavilion, a series of wooden boxes containing plants growing in peaty soil in which egg-shaped pebbles are also placed. 59, the textures of vegetation, stones and concrete paving in the garden in the centre of the Brazilian pavilion. 60, potted plants framed in a window in the German pavilion.

58

59



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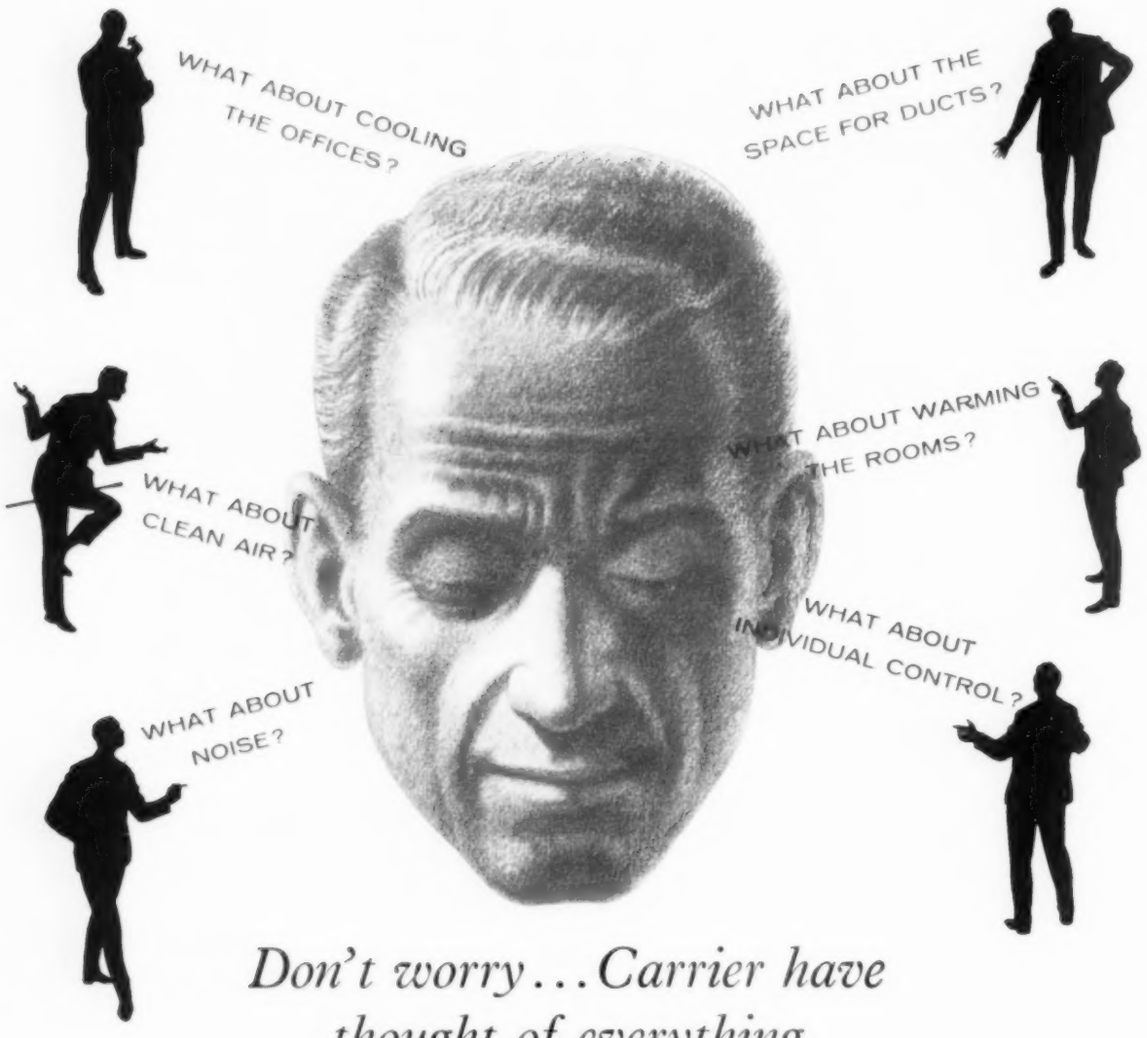

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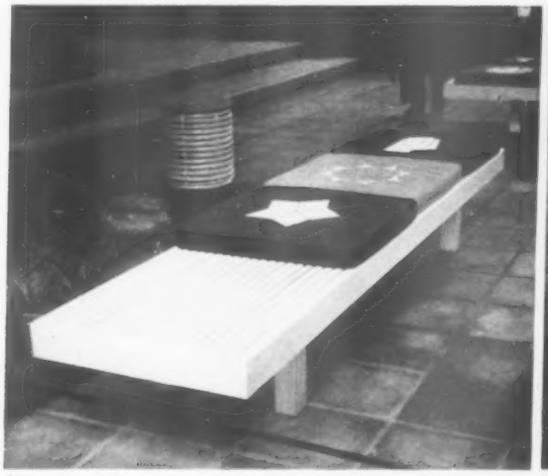

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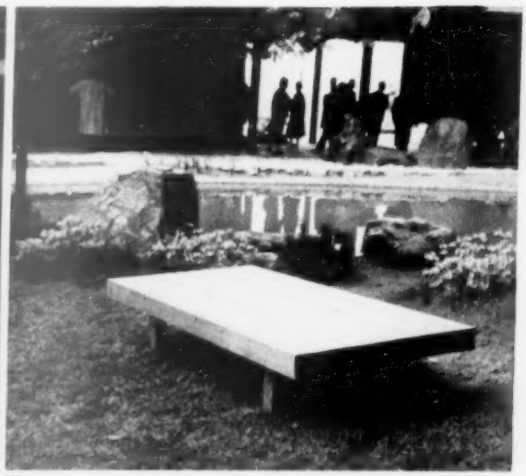


63

seats and chairs

Above, three simple but elegant designs for seats to be found in the Japanese pavilion: 61, low bench inside the galleries, of unpolished white softwood with slatted top, and square cushions brightly coloured and embroidered with emblems; 62, circular bamboo stools in the same gallery (see page 108)—also with coloured cushions; 63, garden seat beside the lake, in hardwood.

64

64, seats in softwood, unpainted, used throughout the Italian pavilion: deliberately weighty in design; the jointing in the backs and in front of the seats is reinforced by iron rods with exposed bolts. 65, a low wooden seat with slatted top surrounding a tree-trunk inside the United States pavilion.

65

66

67

On the left, two oddities: 66, a plywood chair sewn together with leather thongs in the Mexican pavilion—ugly and somewhat absurd, it still has character; 67, basket-work chairs, painted white, in the courtyard of the German pavilion. Though wrong in scale and not very satisfactory in shape, they have an interesting effect as used because of the contrast with the transparent, rectilinear architecture of the building.

seats and chairs

68, the standard aluminium chair, with pierced seat and back, used on all the café and other terraces of the Swiss pavilion. 69, metal framed armchair, with slatted back and seat of hardwood, on the terrace of the Austrian pavilion. 70, indoor furniture in steel rod and bent plywood in the Czechoslovak pavilion.

68

69

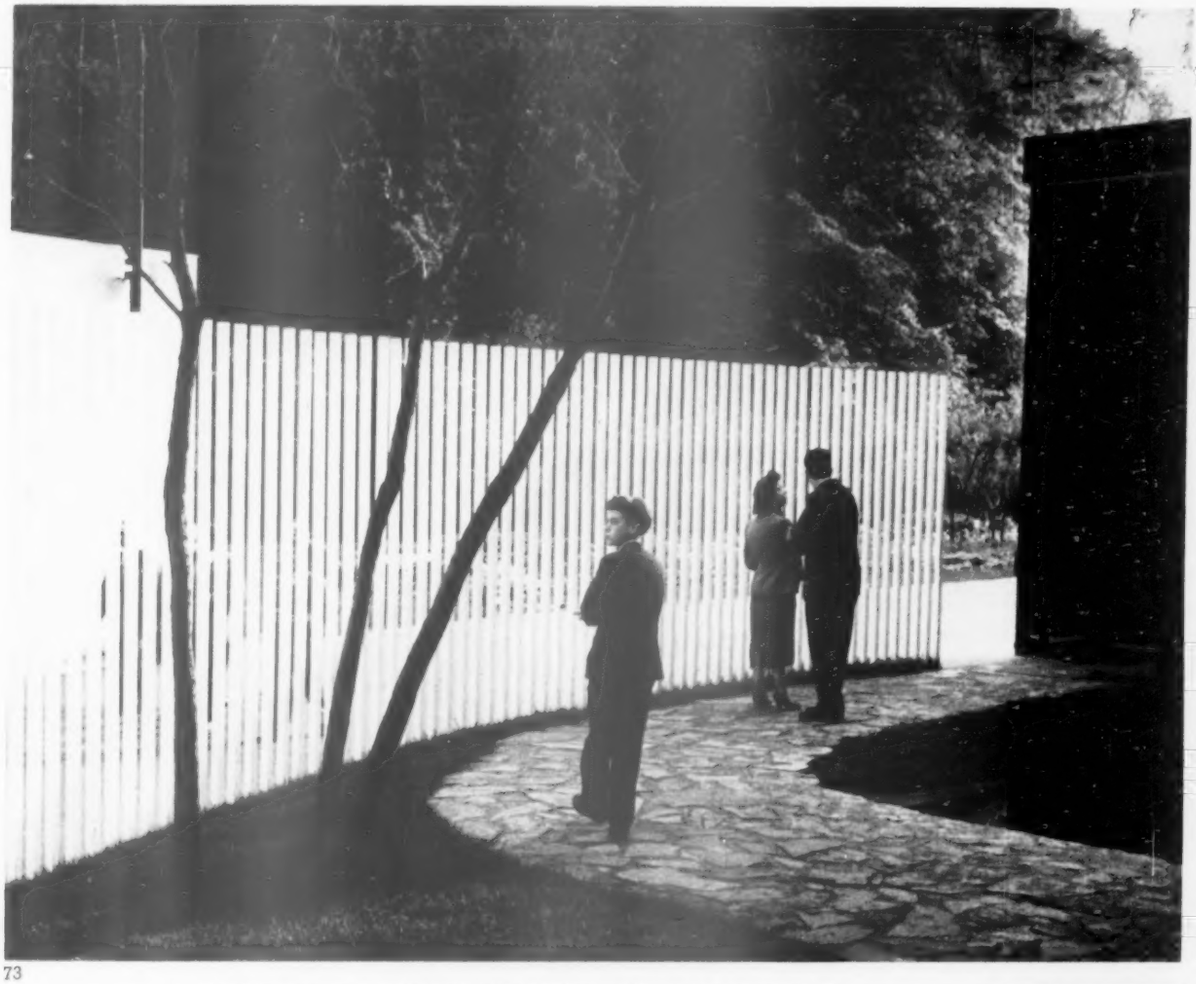
70

sculpture for display

Sculpture effectively used as part of the furnishing of exhibition galleries: 71, in the Mexican pavilion, the funeral orchestra (a traditional local folk art) hung from the ceiling so that the visitor passes underneath it; 72, cage of hammered iron plates, mounted on a wooden frame, enclosing valuable exhibits in the Austrian pavilion. One section of the cage is hinged to form a door that can be shut at night.

71

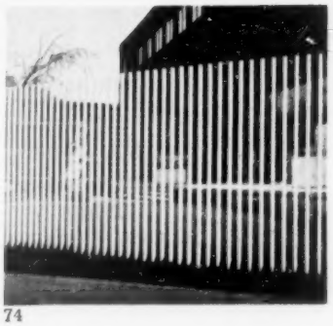
72



73

barriers

The visitor emerges from the back of the Mexican pavilion into a courtyard, 73, containing a pool, around which sculpture is displayed (see page 90). This is open on one side to the avenue that separates the Mexican from the Brazilian pavilions, but is partly enclosed by this simple, functional yet very elegant palisade. It is composed of square-section hollow steel bars, painted white, driven into the ground and without any sort of lateral connections. It makes an almost opaque barrier in the oblique view but can be seen through when looked at directly—as in the photograph from outside, 74.



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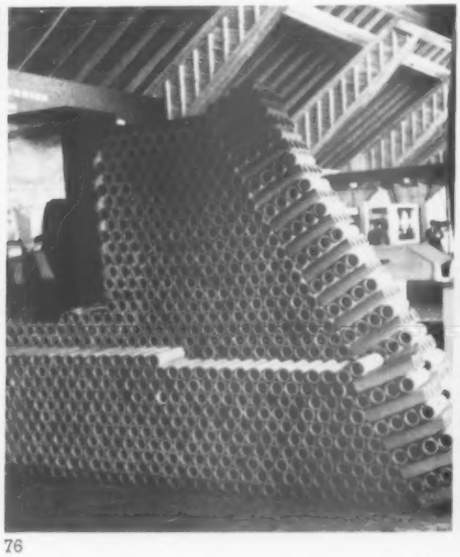

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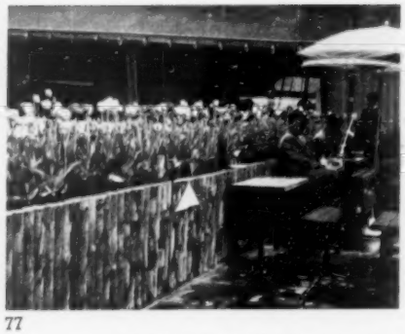


77

Three barriers, each well conceived for its purpose, in the Netherlands pavilion: 75, the minimum functional transparent barrier, composed of iron uprights, tensioned steel cable passing through a loop in top of the upright and plate glass; 76, an entertainingly appropriate barrier of land-drainage pipes, separating one bay from another in the agriculture building; 77, low barrier in the form of a raised flower-bed with walls of split logs, used to screen off an open-air café.

78

79

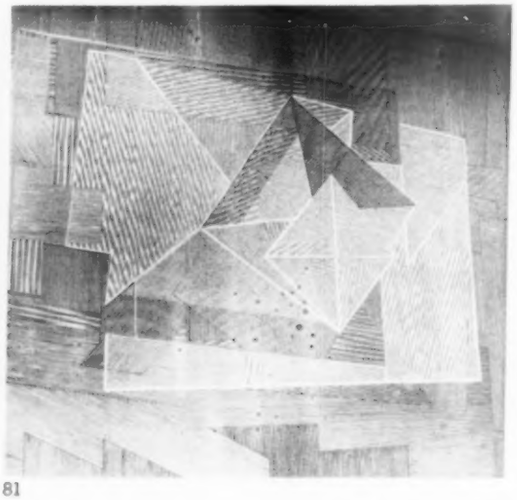
walls as decoration

Two examples, one indoors and the other out, of decoration forming part of the substance of the walls themselves. 78, in the Portuguese pavilion: photomontage incorporated in the glazing of a curtain wall. 79, the screen wall at the end of the garden courtyard section of the British pavilion, facing the industrial building: abstract design in tiles by Peggy Angus.

technique of mural decoration

80, the royal arms in one of the courtyards of the British pavilion: a panel by Edward Bawden, executed in low relief. The design was cut on linoleum, then painted and finally rolled up with printing ink. 81, wall decoration by Soto in the entrance hall of the Venezuelan pavilion, in the form of a screen, standing just free of the wall surface of welded steel wire, woven into various patterns of mesh.

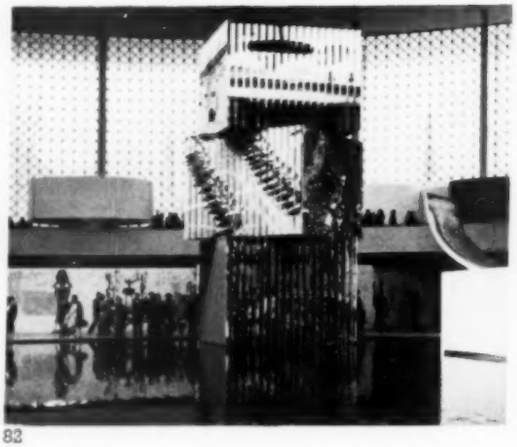
80



81

use of photography

82, column faced with photographs on the edge of the pool in the United States pavilion (interior designer, Bernard Rudofsky—see also pages 94-95), mounted in faceted strips so that the picture changes with the viewpoint; also photographs on the balcony mounted on curved screens, so as to give an illusion of enclosure by the scene depicted. 83, a similar illusion created in the Zuyder Zee exhibit in the Netherlands pavilion, where an aerial photograph occupies a whole wall.



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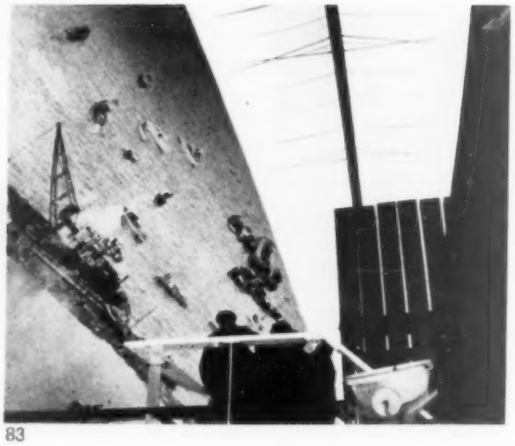

83

Broughton Moor Light Sea Green Slate
at the Brussels Exhibition

Architects: Howard Lobb and Partners

The British Pavilion at the Brussels Exhibition bears the Royal coat-of arms, carved in 'Perspex' with a surround of Broughton Moor Naturally Riven Light Sea Green Slate. The traditional character of this slate contrasts well with the modern styling of the coat-of-arms. The beautiful texture is illustrated in the close-up of a section of the end wall reproduced at the left.

Finely rubbed, sanded and frame sawn finishes are also supplied and technical pamphlets showing typical methods of fixing Broughton Moor stone are available as follows: 1. Flooring; 2. Facings; 3. Coping; 4. Cills; 5. Riven Face Slabs.

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THE HANGING ROOF

by Renate Prince and Richard Hobin

International exhibitions are an accepted trying-out ground for new structural forms. The contribution of Brussels in this field is unquestionably the experiments with 'hanging roofs'. The authors of this article describe and discuss these in the context of the previous development of 'hanging roofs', and conclude that general acceptance of the form is still held up by the lack of development of suitable materials.

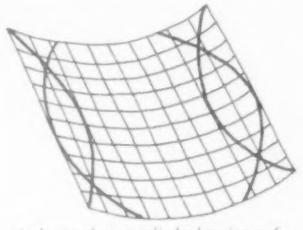
With such obvious exhibition giants as Paxton's Crystal Palace, the Eiffel Tower, and Maillart's 1939 pavilion at the back of the mind, one probably expects a little too much of a world fair, but certainly the conditions are almost ideal for some form of structural experiment. It is therefore at first sight rather disappointing to find that the most advanced structures at Expo '58 are in reality no more than revivals of the hanging roof and that they do not in fact show a final answer to the difficult problems which this poses. On reflection, however, one realizes that it is perhaps even more useful at the present time to clarify existing concepts and techniques than to add to an already unmanageable mass of technical invention; and that even though it is hard to find specific developments at Brussels which add to our technical grammar, we are much richer for the experience which has been gained there.

There are in all seven pavilions which make use, or appear to make use, of tension structures in some form or other. They are the pavilions of the United States, France, Brazil, the Vatican, OEEC, Philips, and the City of Paris. Of these, however, the last two are not discussed in detail here because Le Corbusier's Philips Pavilion is evidently *sui generis* and of little interest in the general problems of building technique, and the pavilion of the City of Paris is in any case small and information about it scanty. The commonest application of the principle is the hanging roof, and all five of the other pavilions named have this, the only possible exception being that of OEEC where the roof is only partially 'hanging.' Special note must also be made of the United States Pavilion (see pages 94-95) which has an exceedingly interesting tension wall in addition. The main use of the tension principle, however, is for roofing, and this is the real subject of this article. Before considering each pavilion in turn, it is necessary to discuss the principle of the hanging roof and to refer briefly to some of the more important examples prior to Brussels. But first a definition must be made.

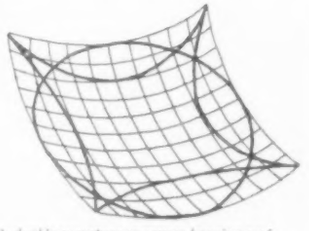
For our purpose a 'hanging roof' is one whose main spanning element is a free hanging membrane or mesh. The principles governing this type of roof have been known and made use of since earliest times, from the first nomadic tents, through the Colosseum to Bogardus's projected amphitheatre in 1853 and on to Novicki's Raleigh Arena, the Schwarzwaldhalle, Notre Dame High School gymnasium, Frey Otto's numerous canvas structures, and the Berlin Kongresshalle of the present day. There has, however, been no *continuous* development of hanging structures comparable, say, to the development of shell concrete since its first appearance early in this century. Designers have been unwilling to make it a part of their technical equipment. The reason for this will appear when we consider the inherent difficulties to which the form gives rise.

The Types of Hanging Roof

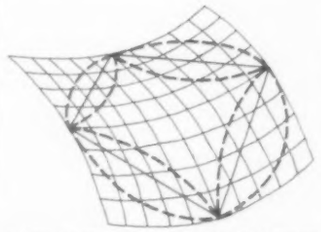
Hanging roofs can be divided into three categories, according to the shape of the roof surface: single curvature or cylinder, 1, double curvature or saucer, 2, two-way opposed curvature or saddle roofs, 3. The



1, single curvature or cylinder hanging roof.



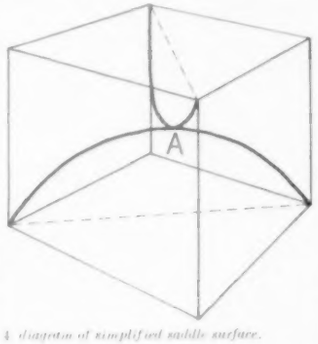
2, double curvature or saucer hanging roof.



3, two-way opposed curvature or saddle hanging roof.

properties of cylinder and saucer roofs are similar; it will, however, be simpler to discuss these properties in terms of a free hanging cable, which is statically a very close approximation. A thin flexible cable automatically takes up an equilibrium position under any load system; if the load changes, the cable changes shape. A cable is a tension arch, the equilibrium position reflects the thrust line of a compression arch; similarly the barrel vault and dome are the corresponding compression forms of cylinder and saucer hanging roofs. (Gaudi, for instance, determined the thrust line of his arch structures from models of the corresponding hanging roofs.)

The shape of saddle surfaces is entirely determined by the chosen generating curves. It is not a free hanging form and only elastic deformations can occur. A saddle roof if inverted remains a saddle roof, which suggests that this form is suitable for both tension and compression structures. Figure 4 shows a simplified saddle surface where the supported surface is reduced to a



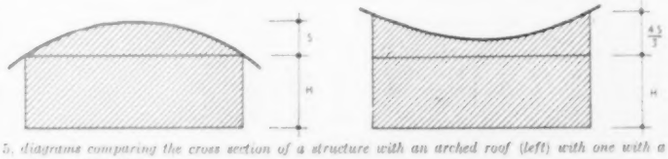
4, diagram of simplified saddle surface.

single point. If the members can resist tension only, a downward load at A is resisted by the two upper members and an upward load by the two lower members; if the members can resist compression only, the reverse is true. With all the members pretensioned, a load at A will increase the tension in two members and decrease the tension in the other two, which are then in effect resisting a compression force. The reverse applies if the members are precompressed. In short, the unique characteristic of a saddle roof is that the external forces can be resisted with the membrane entirely in tension, or entirely in compression, or partly in tension and partly in compression. (N.B.—A hanging roof can be a saddle roof but a saddle roof is not necessarily a hanging roof.)

The efficiency of a hanging roof depends to a large extent on the way the tension in the roof membrane is resisted at the edges. These forces can be carried by the walls, but the overturning moment at the base of the walls would be enormous and it is usually more economic to resolve these forces at eaves level. This can be done in three ways: a compression solution with a stiff ring at the edges, a bending solution with beams or trusses lying in the plane of the membrane, and a tension solution with inward curving cables strung between points of support, which must in turn be braced back to the foundations.

The advantages and disadvantages of a hanging roof as a structural form can best be illustrated by comparison with its nearest 'relative' the arched roof. The diagrams in 5 show that for a given span and volume the overall height of a hanging roof is greater than that of an arched structure, and that the loads from the tension membrane are at the highest point, which is an obvious difficulty. The wall area is necessarily greater, and the internal clear height less, for a hanging roof, except in the case of a hanging roof supported or suspended at the centre. The major advantage is its potentially favourable weight-span ratio. A hanging roof is extremely efficient for uniform loads, but under changing systems such as wind and snow loading, the change of shape, which may be quite sudden, can be a very great disadvantage. Bad aerodynamic shapes, and necessarily high outside walls, give very large wind load areas and high unit wind load pressures. The main difficulty inherent in hanging roof structures, then, is to find a solution to the wind load problem.

Cylinder and saucer roofs (in their simple form) can only be stabilized



5, diagrams comparing the cross section of a structure with an arched roof (left) with one with a hanging roof (right).

against uplift by the self-weight of the membrane, but a heavy membrane negates one of the main potential advantages of a hanging roof structure. For example, Belli and Belli's gymnasium at Notre Dame High School, Illinois, has a cylinder roof spanning 155 ft. The membrane is ¼ in. thick steel plate, but if it takes 10 lb. sq. ft. of steel to solve the wind load problems, the roof is obviously uneconomic. To make such roofs economic the membrane must be stiffened by trusses or beams, but this in turn complicates the structure to such an extent that the initially simple form becomes pointless.

With the development of the saddle roof all these problems have been resolved. It is, in fact, the ideal form for a tension membrane, since under wind and snow loads only elastic deformations are possible, and these deformations can only be small except in the case of very large and shallow saddles which are liable to flutter round the edges, where the curvature is least. Further, the stability of the structure is independent of the weight of the membrane. Novicki used a saddle roof at Raleigh and this form has been used for almost all permanent hanging roofs since.

To sum up the position before Expo 58, one can say, in brief, that the geometric properties of the various forms of the hanging roof had been established and evaluated, that the remaining unsolved problems were mainly those connected with finding some suitable form of membrane material, and that none of the examples of hanging roofs built so far have fully exploited the potential use of this structural system, with one exception—the various canvas structures designed by Frey Otto, but these, of course, intentionally by-pass the problem of permanence.

We come to the main point—have the designers at Brussels at least assimilated the existing knowledge and if so have they contributed anything new?

Roof Types at Brussels

At Brussels all three types are to be seen. The Brazilian, Vatican and United States Pavilions are examples of the saucer, the French Pavilion is an example of the saddle, and the OEEC and City of Paris Pavilions, in so far as they are classifiable as hanging roofs at all, are examples of the cylinder.

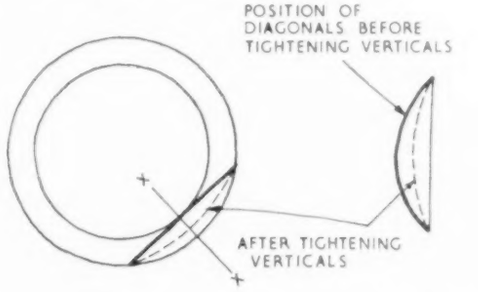
Brazil

The roof of the Brazilian Pavilion (architect Sergio Barnardes) is a saucer 200 ft. long by 120 ft. wide with column supports on all four sides at about 25 ft. intervals (see figures 7, 8 and 9). At first sight it appears to be supported mainly from a system of cables suspended from the four corner towers. In fact the weight of the roof is taken, not by the corner towers (which are far too light for the purpose) but by cables spanning the long direction which pass over steel columns at the ends and are tied down to anchor blocks in the earth. It seems that the designers of this pavilion had some preconceived idea of a light elegant structure—a thin membrane between four thin pylons—but they have chosen a structural form where stability is directly dependent on weight. Faced with this dilemma, the designers have chosen to 'express' a make-believe structure and to disguise the actual (e.g. the main) columns, which appear to do no more than hold up the decorative screens, are heavily plated *on the inside* and actually carry four-fifths of the load of the roof, whereas the four 'main' pylons could probably be omitted altogether. The main purpose of the corner pylons is to take the horizontal wind load on the long walls. The reverse wind load is taken by the dead load of the deck which is of concrete, thickened at the ends where the uplift will be greatest, and laid on a permanent shuttering of asbestos cement and m.s. tees spanning between the cables; but also by guy wires attached to a circular steel ring trimming a central opening. It is interesting to notice that the span of this pavilion is only slightly smaller than that of the French Pavilion.

The Vatican

The Church, 6, the of Vatican Pavilion (architect Paul Rome) is roofed with a saucer which is fan-shaped on plan. This, like the Brazilian roof, shows a major discrepancy between the visual effect and the structural reality. Supported at one end 66 ft. up a concrete tower, it sweeps down and rises to a second peak at the other end, the visual inference being that the whole curve forms part of a single structural system. In fact the hanging roof proper stops immediately at the back of the nave, at the lowest point of the curve, where the main cables are anchored in a series of reinforced concrete buttress walls forming the divisions between the confessionals. Transverse cables, curved on plan (which suggests that they are carrying little weight) span between nailed timber 'fins' cantilevering from the foundations at the outside walls. All cables are cased in timber and the panels between are spanned with a diagonal 'eggcrate' of timber carrying the roof. Apparently the weight of the roof is enough to stabilize against uplift. The length is 140 ft. and the width varies between 40 ft. by the tower to 140 ft. at the back of the nave. From the structural point of view the hanging roof is a reasonable choice for the job and the solution is straightforward and simple.

6, the Vatican pavilion church.



10, diagrams of tension wall of United States pavilion showing, top, plan and elevation of verticals before and after tightening and, right, the finished wall. The curvatures are much exaggerated.

United States

The American Pavilion (architect Edward Stone) is a rotunda 330 ft. in diameter. The roof, 300 ft. in diameter, is a hybrid structure as it is really two separate structural systems: a hanging roof which hangs between a wide edge rim and the top of a central steel hub, and a suspension system supporting the steel hub. (See front cover.) Under reverse wind loading the top membrane would act as a saucer and the suspension cables would be unstressed. The wall structure, 10, is a 50 ft. high hyperboloid membrane midway between the two rows of columns, stretched from the roof edge beam to a ring beam at door-head height. The membrane is a mesh of 2 in. by ⅜ in. steel flats in three directions. First the diagonals are fixed in position and tightened until they are straight, forming a shape similar to a wire waste paper basket. Next the verticals are placed behind the diagonals and tensioned. This reduces the vertical curvature of the membrane and causes each diagonal member to bow outwards. This stretches the diagonals. Any wind pressure loads are then taken on the verticals and any suction on the diagonals, which also completely brace the structure. In the complete structure only the columns and the edge beam are in compression. The US pavilion is rather difficult to assess, because the dominantly formal approach left few problems to be solved in primarily technical terms. This is clearly shown in the roof

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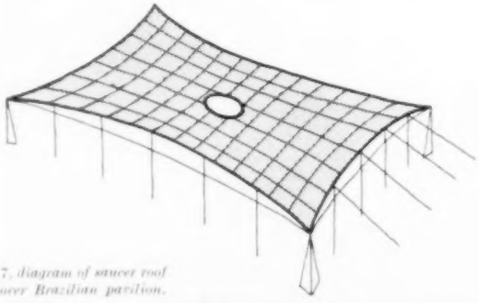

7, diagram of saucer roof over Brazilian pavilion.

8, view of corner of Brazilian pavilion. Two of the guys which carry the main roof load can be seen behind the first column on the left (see also pages 90-91).

9, detail of roof of Brazilian pavilion showing connection of cables to edge truss.

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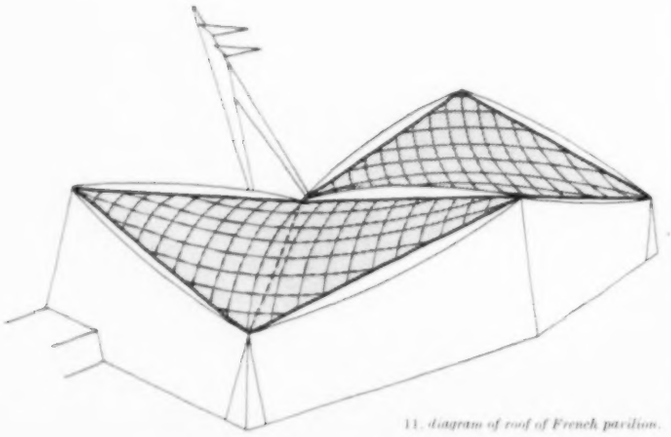

11, *diagram of roof of French pavilion.*

structure—the suspended ceiling is the chosen form, and the roof itself is merely a waterproof skin. The detail (which is unimportant formally) is not well worked out. A material (polyester glass fibre) with all the properties needed for a tension membrane, is laminated into stiff panels and joined with elaborate flexible joints, which ignores all the possibilities of the material. On the other hand the wall, which at first seems to be merely a decorative screen, is actually a brilliant technical innovation, and it must be conceded that the building as a whole is a very convincing use of tension membrane construction.

France

The French Pavilion roof (architect Guillaume Gillet) is of the saddle type and is in the form of two lozenge-shaped hyperbolic paraboloids, each side of the lozenge being approximately 230 ft. long and sloping 1 : 5. The lower corners, on the shorter diagonal, are 57 ft. above floor level, and the higher corners, on the longer diagonal, are 110 ft. above floor level. The saddle roof surfaces are formed by cables hung parallel to the longer diagonal and held in position by cables parallel to the shorter diagonal, 11. The ends of the trusses at the two higher corners of the building were first erected above the final position and, after stringing the cables in a just-tight condition, were lowered into place. This automatically introduced the required stress into each cable. The tension forces in the cables are resisted at the edges by bow-string trusses lying in the roof plane. The cables act as a tie between the higher corners, and so each lozenge is virtually balanced on the enormous arms cantilevered out from the base of the tower. This tower helps to counterbalance the roof, and most of the roof load is taken on the foundation at its base, the remaining load being taken by inverted V props at the end of the arms. The roof is insulated with a glass fibre blanket and sheathed with 10 ft. squares of sheet-steel waterproofed with a plastic skin.

The designers claim that the structural system chosen was necessary in order to avoid the tunnel running underneath the building. This is doubtful, and in any case the initial concept in no way justifies the disastrous complexity of the end product. Two examples will make this clear. First, the maximum slope of the roof cables (as distinct from the girders) is approximately 1 : 6. The load on the edge girders will equal the dead load multiplied by the

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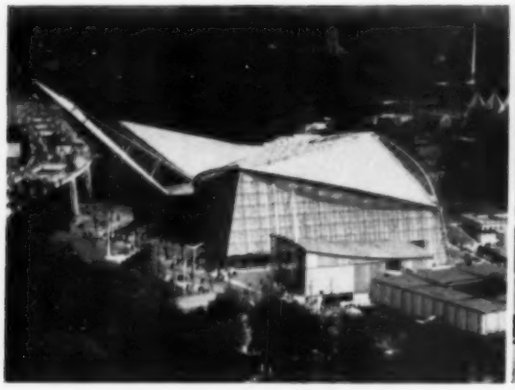
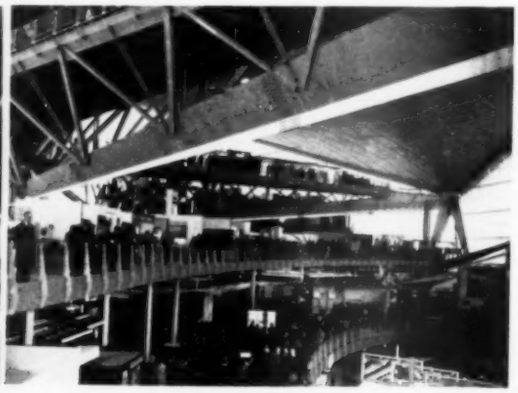


12, *general view of French pavilion.*



13, *interior of French pavilion looking towards one of the lower corners.*

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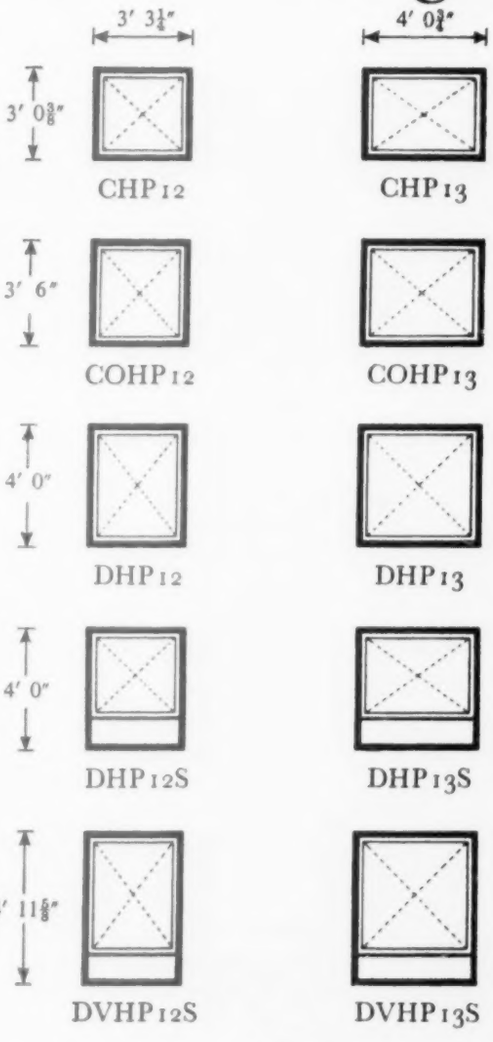

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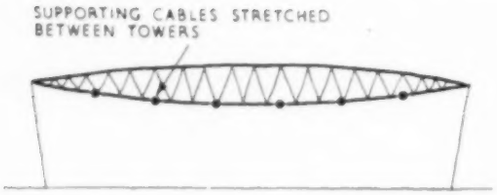


14. *diagrammatic section through OEEC pavilion.*

15. *general view of OEEC pavilion.*

reciprocal of the maximum gradient of the cable (i.e. the steeper the gradient the less the load). Therefore the total load on the edge girders must be at least six times as great as the vertical component of the reactions from the membrane. This is about three-quarters of the total load on the roof. This means that the edge beams carry at least four and a half times the total load on the roof, and these beams (each weighing over 100 tons) use almost three times as much steel as would be necessary for a standard roof of the same span. Secondly, in the construction of the outside walls, almost every brace, web and chord member is of different length or section, which involves an enormous amount of labour in calculation, drawing and fabrication, and must greatly increase the possibility of error.

OEEC

The last roof to be considered here, that of the OEEC Pavilion (architect Karl Schwanzer), if it is to be classified as a hanging roof at all, is probably a cylinder, since the transverse camber on the roof surface is produced not by transverse cables, as in a saddle roof, but by the top booms of a series of tapering transverse trusses, 14. Steel cables run the long way of the roof, being suspended from two end pylons, and pass under the bottom booms of the transverse trusses. Part of the load on the trusses is carried by the cables and part by columns in the side walls. The actual roof membrane is cocoon plastic sprayed on to close-spaced wires stretched over cables which run the length of the building on top of the trusses. The roof structure is approximately 250 ft. long and 150 ft. wide. The clear height at the centre is approximately 33 ft. and at the ends 57 ft. Reverse wind loads are carried by the trusses, and wind loads on the walls are carried to the pylons by arched girders in the roof plane at eaves level, 15.

The designers state that this construction has been adopted because it spreads the load evenly over the foundations, but this could be done much more simply. Perhaps a more convincing explanation of the structure is the symbolism used by the designers to explain the forces in the roof: 'The trusses represent the individual members, and the cables running lengthwise the support given by the OEEC, and without this mutual support neither system could carry the load.' The designer has set himself a much more complicated problem than was necessary, but his solution is competent and well detailed, though of little significance in the development of hanging roofs.

Conclusions

One thing is shown very clearly by the roofs discussed in this article: that the choice of a tension membrane structure imposes a rigid discipline in design and detail, and it is only by accepting such a discipline that the very great potential of these structures can be realized. In the end, the use of a new structural system is usually dependent on the use of a new material and it seems that the hanging roof, though theoretically completely evolved, will not be widely adopted until its particular materials have been further developed.

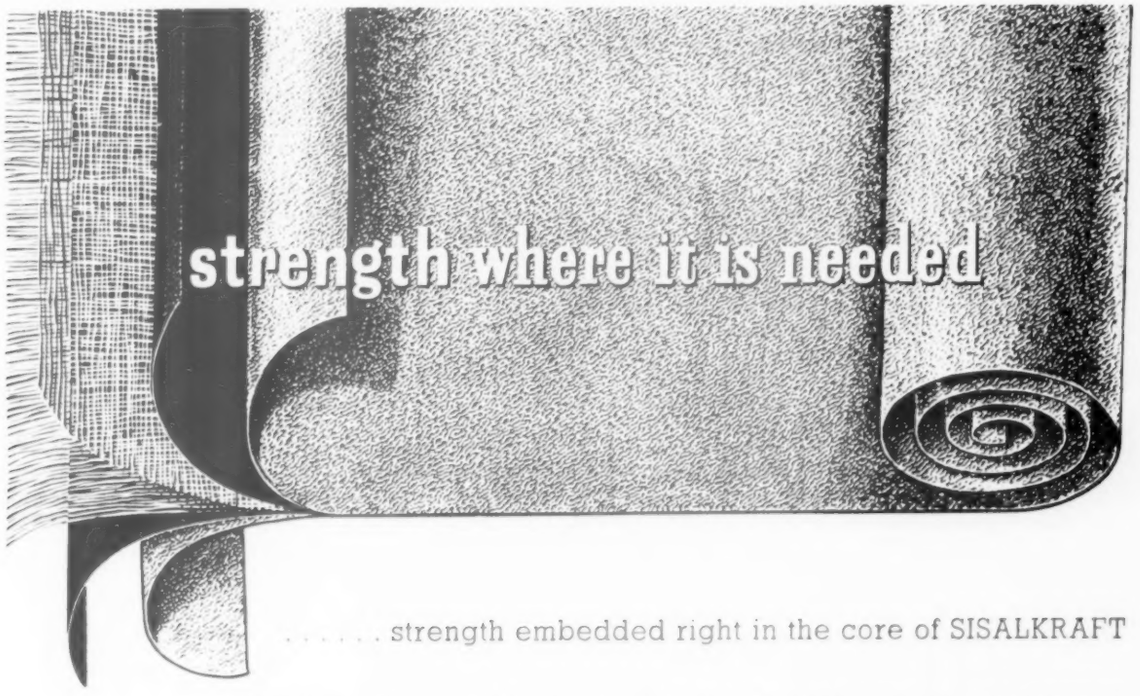
CONTRACTORS etc

Contractors, sub-contractors and suppliers of materials for the British Government and the British Industry pavilions.

The *co-ordinating architects* for the British section of the exhibition were Howard Lobb and John C. Rateliff of Howard Lobb & Partners (who also designed the Government Pavilion); the *co-ordinating designer* was James Gardner (who was also display designer of the Government Pavilion). M. J. Blower was *resident architect* for both pavilions.

Government Pavilion. *Architects:* Howard V. Lobb & Partners. *Display designer:* James Gardner. *Subsection designers:* Beverley Pick, Gordon Bowyer and members of the Royal College of Art—a design group under the chairmanship of Sir Hugh Casson. *Landscaping consultant:* G. P. Youngman. *Consultant engineer:* Felix J. Samuely. *Quantity surveyors:* C. E. Ball & Partners. *General contractors:* R. Costain & Enterprises Blaton-Aubert. *Nominated sub-contractors: Towers and V.I.P. pavilion:* Rainham Timber Engineering Co. *Space deck units and steelwork block 'b':* Space Decks Ltd. *Electrical work:* Troughton & Young (Electrical) Ltd. *Planting and landscape work:* Wm. Wood & Sons Ltd. *Suspended ceilings:* Anderson Construction Co. *Tiled mural:* Carter Tiles Ltd. *Flooring to Hall of Technology:* Marley Tile Co. *Flooring to administration block:* Armstrong Cork Co. *Flooring to canopy:* Semtex Ltd. *Extract ventilators:* Colt Ventilation Ltd. *Plate glass:* Pilkington Bros. Ltd. *Sanitary fittings:* Shanks & Co. *Front entrance doors:* F. Sage & Co. *Perspex louvres:* Imperial Chemical Industries. *Fabrication of louvres:* Talbot Designs Ltd. *Slate facing:* Broughton Moor Green Slate Quarries Ltd. *Plastic lining to pool:* Marley Tile Co. *Paint:* R. Gay Ltd. *Tapes to crystalline balls:* Winn & Coales Ltd. *Coloured glass eyelets:* James Hetley & Co. *Main display contractors:* F. W. Clifford Ltd.

British Industry Pavilion. *Architects:* Edward D. Mills & Partners. *Display designer:* John Lansdell. *Assistant display designer:* Arthur Braven. *Quantity surveyor:* Leslie W. Clark. *General contractors:* R. Costain Ltd., & Enterprises Blaton-Aubert. *Main Pavilion: Steel frame:* Concrete & Structural Products Ltd.; Carter Horseley Ltd. *Curtain wall framing:* Rainham Timber Engineering Co. *Bitumetal roofing:* Wm. Briggs Ltd. *Extractor units:* Brooks Ventilation Ltd. *Abstraform mural:* Plyglass Ltd. *Glazing:* Pilkingtons Ltd. *Mastic bedding to glass:* Secomastic Ltd. *Paint for steel frame:* Walpamur Ltd. *Paint for bitumetal roofing:* Lewis Berger Ltd. *Lighting fittings:* A. E. I. Lighting Ltd. *Electrical installation:* James Kilpatrick Ltd. *Sub-station equipment:* English Electric Co.; The Pyrene Co. *Plastic to counter fronts and screens:* Bakelite Ltd. *Thermoplastic flooring:* Armstrong Cork Co. *Rain water chutes:* Rainham Timber Engineering Co. *Illuminated title panel:* Pearce Signs Ltd. *Mezzanine floor offices: Thermoplastic tiles:* Armstrong Cork Co. *Lighting fittings:* A.E.I. Lighting Ltd. *Automatic telephone equipment:* Standard Telephones & Cables Ltd. *Sanitary fittings:* Doulton Ltd. *Illuminated title panel:* Pearce Signs Ltd. *Muraglass infill panels:* Pilkingtons Ltd. *Ironmongery:* Dryad Ltd. *Plymax partitions:* Venesta Ltd. *South End Zone: Steel frame, woodwool roofing slabs, curtain walling, precast concrete cladding units, fibrous plaster ceiling panels:* Hills (West Bromwich) Ltd. *Glazed asbestos panels:* Universal Asbestos Manufacturing Co. *Extractor units:* Brooks Ventilation Ltd. *Paint:* International Paints Ltd. *Ironmongery:* Dryad Ltd. *Cement paint:* Cement Marketing Co. *Cinema: carpets, seats:* Rank Precision Ltd. *Cinematograph equipment:* Rank Precision Ltd.; Major Equipment Ltd. *Screen and gear:* Rank Precision Ltd. *Lighting fittings:* Troughton & Young (Lighting) Ltd. *Screen curtains:* Tibor Reich. *Glazing:* Pilkington Bros. *Ironmongery:* Dryad Ltd. *Lighting equipment:* Major Equipment Ltd.; Strand Electric Ltd. *Self-service shop: Thermoplastic flooring:* Armstrong Cork Co. *Display racks and counters:* F. Sage Ltd. *Illuminated entrance sign:* Pearce Signs Ltd. *Ironmongery:* Dryad Ltd. *Suspended ceiling:* Lumenated Ceilings Ltd. *Main entrance canopy:* Spacedecks Ltd. *Lighting fittings thereto:* A.E.I. Lighting Ltd. *Asbestos cement trays:* Turners Asbestos Cement Co. *Vertical feature: Steel tube and channel rings:* Carter Horseley Ltd. *Prestressed steel rods and prestressing equipment:* Lee McCall Ltd. *Lighting fittings:* Thorn Electric Ltd. *Fluorescent paint:* Strand Electric Ltd. *Fog detector unit:* Stone-Chance Ltd. *Britannia Inn: Glued laminated columns and beams:* Rainham Timber Engineering Co. *Thermoplastic flooring:* Semtex Ltd. *Extractor units:* Brooks Ventilation Ltd. *Timber windows:* Kings of Teddington Ltd. *Paint:* Hadfields Ltd. *Wallpaper:* Sanderson & Co. *Sanitary fittings:* Doultons Ltd. *Refrigeration units:* English Electric Co. *Lighting fittings:* G.E.C.; Courtney Pope Ltd.; Falk Stadelmann Ltd. *Counter fittings, etc.:* F. Sage Ltd. *Outdoor furniture:* Ernest Race Ltd. *Curtain fabrics:* Tibor Reich. *Folding doors:* Modernfold Ltd. *Illuminated signs:* Pearce Signs Ltd. *Built-in seating and tables:* Charles Pateman Ltd. *Hardboard ceiling panels:* Celotex Ltd. *Plastic table tops:* Wareite Ltd. *Chairs:* Goodearl Bros. *Carpets:* S. J. Stockwell (Carpets) Ltd. *Upholstery fabric to furniture:* Edinburgh Weavers Ltd. *Hide upholstery:* Connolly Bros. *Ironmongery:* Dryad Ltd. *Cement paint:* Cement Marketing Co. *Lighting fittings to bridge:* A.E.I. Lighting Ltd. *Lighting fittings to balcony:* G.E.C. Ltd. *Kiosk shops: Steel frame and timber roof units, glazing, paint:* F. Sage Ltd. *Ironmongery:* Dryad Ltd. *Cement paint:* Cement Marketing Co. *Landscapi g: Landscape contractor:* Wm. Wood & Sons Ltd. *Public lavatory block: W.C. partitions:* Venesta Ltd. *Sanitary fittings:* Doulton Ltd. *Cement paint:* Cement Marketing Co. *Ironmongery:* Dryad Ltd.



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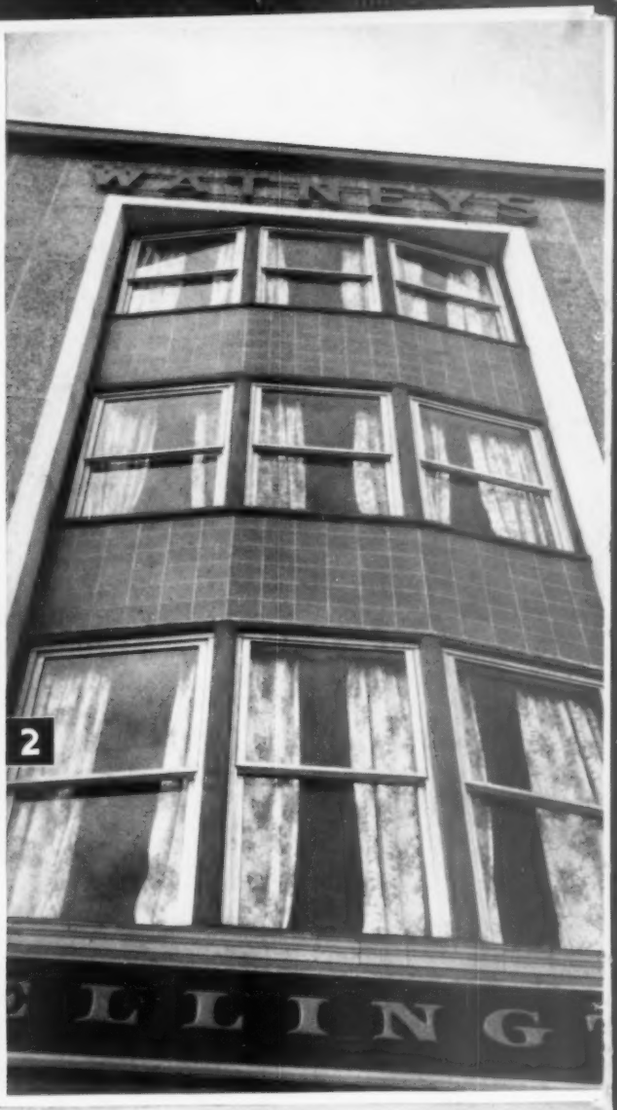

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5B

monthly review by WILLIAMS & WILLIAMS

CANADA'S NEWEST HOTEL HAS THE 'WALLSPAN' LOOK

1 The entire cladding contract for the new Lord Simcoe Hotel (the second largest in Canada) was placed with Williams & Williams. And 'Wallspan' is used for the vast areas of curtain walling.

The 20 stories of this 900 room, 10 million dollar hotel make an imposing addition to Toronto's skyline. Viewed from a distance, the giant structure appears to be bathed in a greenish aura. This strangely impressive effect is obtained by the combination of green porcelain enamelling and grey muroglass infilling panels.

All of the vertical columns and horizontal trims of the curtain wall are covered by the green porcelain enamelled panels. This looks to be a grey-green colour when reflected by the muroglass —33,000 square feet of it in the spandrels of the 'Wallspan' grid.

Williams & Williams purpose-made aluminium windows were used in the 'Wallspan.' And the actual arrangement of the windows over 'divided' infill panels is somewhat unusual.

Apart from the aesthetic considerations, a valuable point in favour of using 'Wallspan' was its speed of erection. In this particular instance, the choice of 'Wallspan' curtain walling effected a considerable saving in time—from the moment the first sod was dug to the official opening ceremony, took only seventeen months.

'ALOMEGA' WINDOWS EXCEED ARCHITECT'S EXPECTATIONS

2 The Wellington Hotel, Hastings, situated right beside the sea, now boasts a proud new facade. And its 'Alomega' windows, invulnerable to the corrosive action of salt-laden sea air, have been widely praised. The architect himself, had several enthusiastic things to say about them.

"I am very pleased indeed with the 'Alomega' windows," he writes. "They have certainly exceeded all my expectations and are draught and weatherproof. The tenants are equally amazed at their efficiency and simplicity.

"I have had many pleasing comments from my friends on the appearance of the windows, and I shall use them wherever I can after the testing they have had in this very exposed position."

SPACIOUS SHOWROOM HOUSES PERMANENT EXHIBITION

3 The modern London showroom at 36 High Holborn, W.C.1, contains a comprehensive selection of Williams & Williams products. Here, in comfort and at your convenience, you can view and examine examples of all the products mentioned on this page. This is a *permanent* exhibition of the latest developments by Williams & Williams. It is open daily from 9 a.m. to 5.30 p.m.

THE CASE OF THE FLYING WINDOW

4 It would perhaps be a slight exaggeration to say that the team of Williams & Williams window fixers got the full red carpet treatment when they landed at Lima Airport. Nevertheless, the window that they brought with them *was* inspected by the President of Peru. And a huge and valuable contract *did* go to Williams & Williams.

The events leading up to this happy occasion were triggered off by an invitation to Williams & Williams. They were asked (at rather short notice) to quote (in competition with the Americans) for the windows, which were to be made of aluminium, for the new Lima Hospital.

Seven men worked round the clock for seven days (over the Easter holiday, as it turned out). The result was that the tender and drawings were flown out in the nick of time before the closing date.

Williams & Williams price turned out to be easily the lowest. But in the meantime the Peruvian authorities, in some inexplicable way, had got hold of an idea that our windows might possibly be inferior to those made on the other side of the Atlantic. We were asked to prove different!

We pulled out all the stops and made a sample window (to specification) in one week. Thereupon the aforementioned team of fixers plus window were loaded into a fast aeroplane and flown to Miami. There they but paused to take breath (and change aeroplanes) before continuing to Lima. The rest of the story you know.

'WALLSPAN' PRESCRIBED FOR MILLBROOK CLINIC

5 This clinic has to provide maternity, child welfare, school medical and dental services for the entire development carried out by the Southampton Borough Council at Millbrook. The building contains an unusually large number of small rooms, which required varying degrees of natural daylight, ventilation and privacy. Conventional fenestration would have led to an unhappily fussy facade, and therefore it was decided that the main elevations should be treated as all embracing window walls, within which variations in sizes and types of windows could readily and tidily be made. These window walls are in fact areas of Williams & Williams 'Wallspan'. The floors and roofs are carried by the load bearing cross-walls.

In the construction, special steps were taken to give added protection against the spread of fire and to eliminate airborne sound between rooms and stories. The gaps between the mullions and crosswalls at the reveals are closed with a felt-lined, recessed timber closing member; and the horizontal gap between the first floor beams and the curtain wall is closed by carrying the insulation board false ceiling right up to the 'Wallspan' transoms.

Buildings that already existed nearby were a school, the community centre, garages and shops. And the general appearance of these was taken into account when designing the clinic's external finish. On the ground floor, 'Wallspan' infilling panels are of hydraulically pressed asbestos cement slabs. First floor infillings are of grooved western red cedar.

WILLIAMS & WILLIAMS
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1 THE LORD SIMCOE HOTEL, TORONTO
Architect: H. T. Langston.

2 THE WELLINGTON HOTEL, HASTINGS
Architect: Norman A. E. Wyatt, L.R.I.B.A., F.I.A.S.

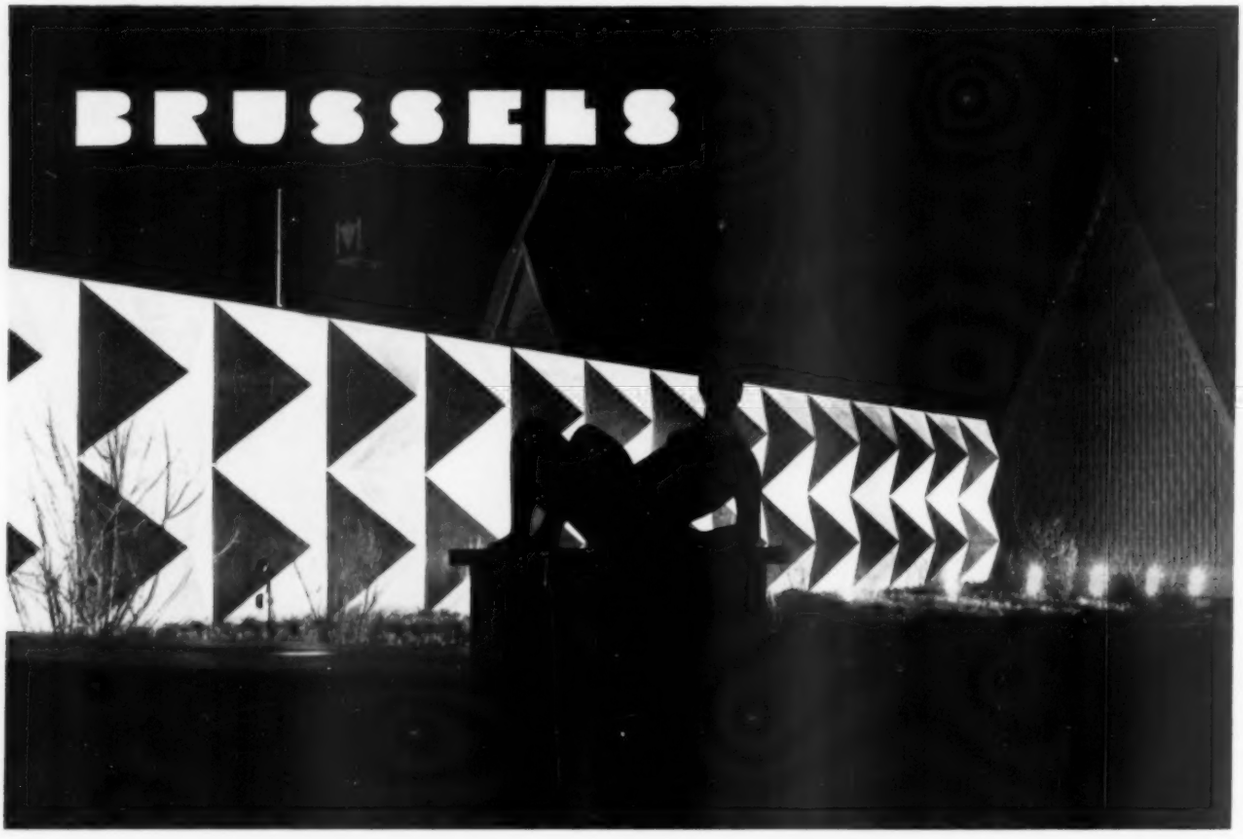
3 WILLIAMS & WILLIAMS NEW SHOWROOM
Architects: Bronek Katz & R. Vaughan.

4 THE LIMA HOSPITAL, PERU
Architect: Ricardo Malachowski.

5 THE MILLBROOK CLINIC
Architect: L. Berger, DIP. ARCH., A.R.I.B.A., *Borough Architect, Southampton.*

A *View from North-West with entrance to school medical wing.*

B *General view. Covered way from gates leading to maternity waiting room.*



International exhibitions such as the current Brussels show call forth the best in design and construction which industry can offer. It is therefore with some pride that we announce that the Anderson Construction Company was chosen to erect suspended ceilings in the British Government Pavilion.

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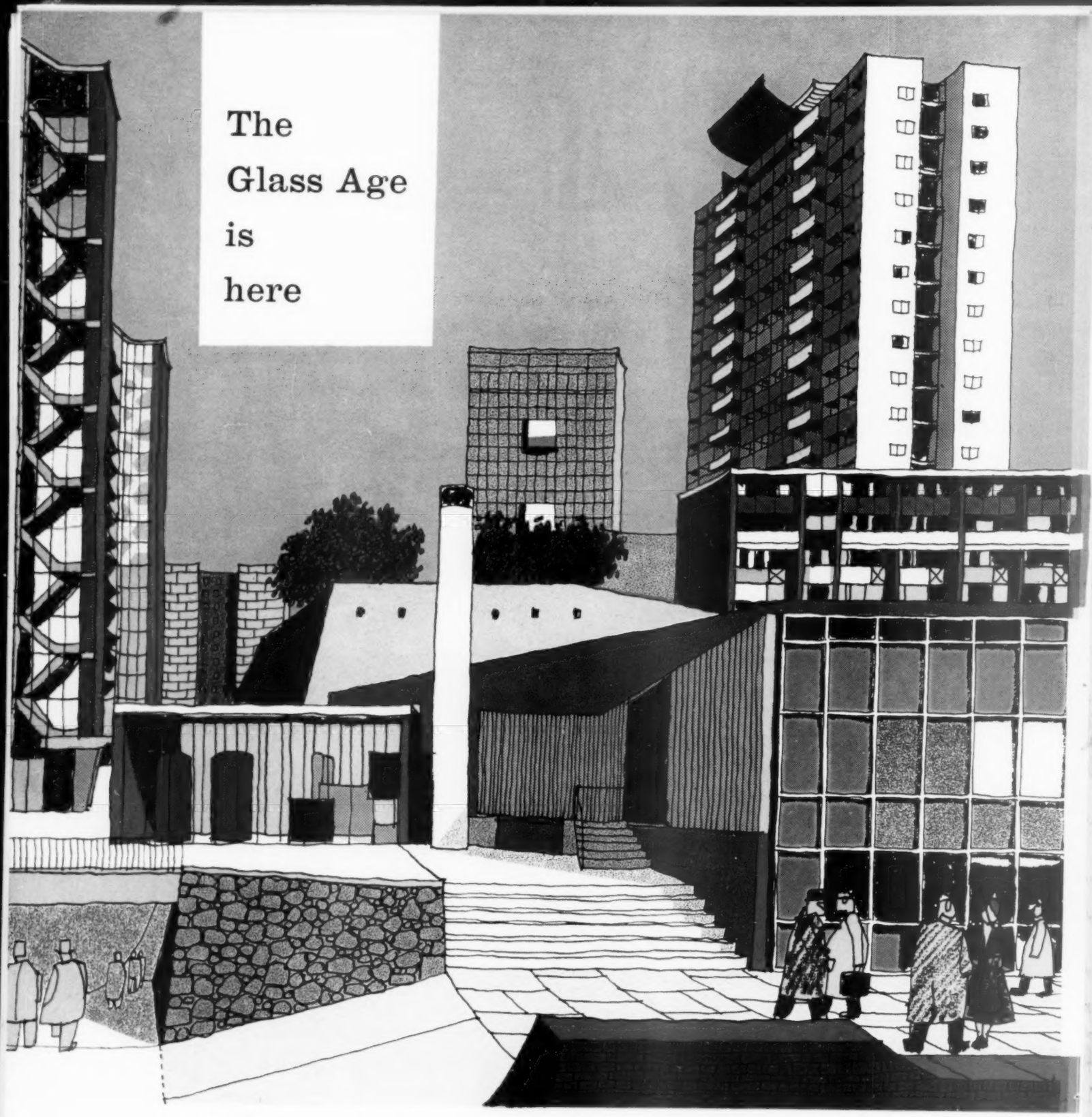


No dream city...

This city exists: not yet as a coherent, related whole, but as individual structures which rise in and around London and show the part glass plays in architectural technique. Here, eight contemporary buildings have been brought together—by Gordon Cullen—rather as Wren's buildings were once assembled in Cockerell's famous drawing. This is not a glimpse of a city of the future: it is a city for which all the components have been designed and built today. The Glass Age is here.

1 *Pimlico Flats — Architects: Powell and Moya,* F.F.R.I.B.A.

2 *Headquarters Offices for National Dock Labour Board — Architect: Frederick Gibberd,* C.B.E., F.R.I.B.A., M.T.P.I.

3 *Golden Lane Housing — Architects: Chamberlin, Powell & Bon,* A.A.R.I.B.A.

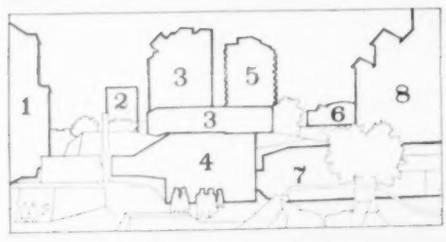
4 *Factory at Hemel Hempstead, Herts, by Ove Arup and Partners*

5 *Housing Project, Roehampton, by the Architect to the London County Council*

6 *Royal Festival Hall, by the Architect to the London County Council*

7 *School at Putney — Architects: Powell and Moya*

8 *School at Tulse Hill, by the Architect to the London County Council*



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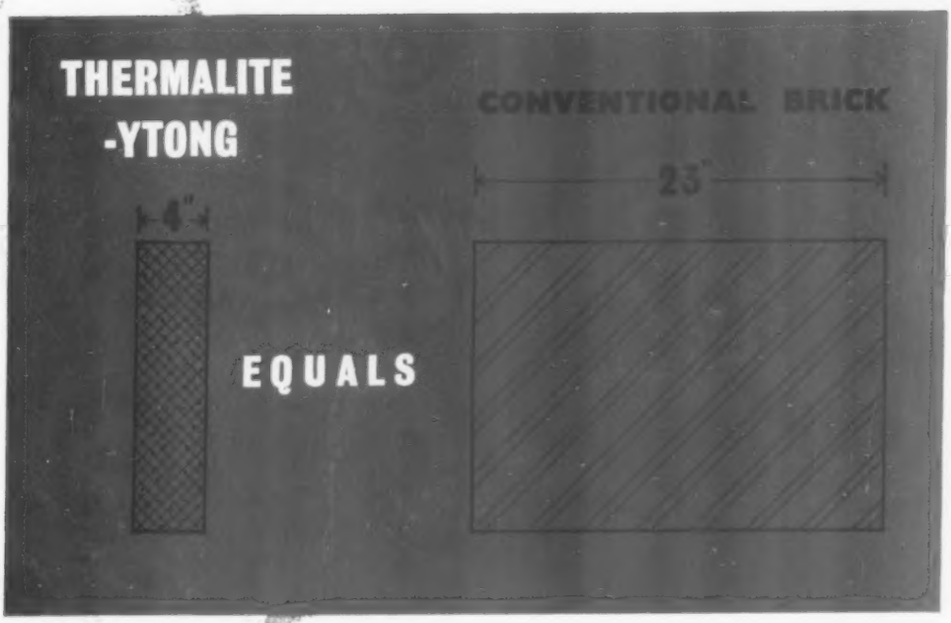

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